2013

ECFS Patient Registry
Annual Data Report

European Cystic Fibrosis Society
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ECFS Patient Registry

Annual Data Report

2013 data

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Preface

We are delighted to share with you the 2013 Annual Report from the European Cystic Fibrosis Society Patient Registry (ECFSPR). This report contains epidemiological data from national cystic fibrosis (CF) registries and individual CF centres throughout Europe and neighbouring countries. It is the seventh official report, and includes demographic and clinical data of 38,985 consenting CF patients from 27 countries.

Since the publication of the 2010 report, we have introduced a new software platform, ECFSTracker. The transition to this new software has taken some time and this has delayed the production of the 2011 and 2012 reports. Thanks to the exceptionally hard work of the participating countries, three years of data – 2011, 2012 and 2013 – have now been submitted to the ECFSPR, which is a great achievement. Reports for the 2011 and 2012 data will be published in electronic format in the coming months. In addition, ECFSTracker has been developed to also include an encounter-based component for direct-entry of patient data. We hope that, over time, the ability to enter encounter-based data in real time may be of value to CF clinicians as well as ensure a faster and more efficient collection of data. For more information on the ECFSTracker software please visit the webpage www.ecfs.eu/ecfspr-software. We anticipate that with the introduction of this new software, the interval between data-entry and production of the report will shorten. In future we aim to publish the ECFSPR Annual Report within 18 months of the end of the data-collection year.

The primary goal of the ECFSPR is to allow comparison between CF clinical outcomes across Europe. The analysis presented in this report has been carried out by the ECFSPR statistician using all the raw data, in anonymised form, entered by participating countries. Analysing the raw data allows comparison between different countries' data, something not possible using the individual countries' own annual reports. As a result, data of some countries as presented in the ECSFPR report may differ from the data published in their national annual registry report. Differences can originate from patient inclusion criteria, different definitions used for disease complications and employment of different reference values. Further details on how this occurs and how this is dealt with can be found in the report and in the List of ECFSPR Variables and Definitions in Appendix 2 on page 120. Currently the ECFSPR is working with other international CF registries to look at how registry data is defined and presented in CF registry annual reports to harmonise the interpretation of CF registry data worldwide.

Over the past three years we have seen continued growth of the ECFSPR with the addition of 4 more countries, Lithuania, the Republic of Macedonia, Romania and Ukraine. This report contains information from 27 countries including 15 with a national registry and 12 countries with multiple centres. A total of 60 centres use the direct-data entry function of the ECFSPR software. We expect that the number of countries participating in the ECFSPR will continue to grow. Managing the ECFSPR comes with a cost and we are deeply indebted to our sponsors whose unrestricted grants have helped support the running and expansion of the Registry.

In addition to being the basis for this annual report, the ECFSPR data is used for research and other purposes to benefit patients with CF. This includes epidemiological research, preparation of the landscape for clinical trials, and production of evidence needed by pharmaceutical companies in order to apply for approval of new treatments. There have been 27 applications requesting to use ECFSPR data during the past three years (2013: 11, 2014: 7, 2015: 9). We are confident that the ECFSPR is evolving into an important tool for CF epidemiology and health service research and are currently working closely with the ECFS Quality of Care Working Group to develop the Registry as a tool for benchmarking and to monitor improvements in CF patient care and outcomes.

The management of the ECFSPR and the development of this report take a considerable amount of work. I would like to take this opportunity to thank the national registries as well as the individual centres, and the country representatives for their participation in the ECFSPR, especially in dealing with the huge demands of data collection and uploading for the 2011 to 2013 years. I would also like to thank the ECFSPR staff that have worked so hard on the production of this report and the running of the Registry. In particular, Jacqui van Rens, the ECFSPR Executive Coordinator, who ensures that everything, from data collection and arrangements for the bi-annual European meetings to handling of research requests, runs like clockwork. I would like to thank the Service Desk, Alice Fox and Patrizia Iansa, for dealing with the many challenges associated with the launch of a new software product. Alice and Patrizia have worked exceptionally hard in providing support on the software to the participating countries with many different languages and multiple different hospital IT systems. Finally, many thanks to our statistician, Anna Zolin, for her careful and professional approach to the data analysis, an essential component of the Registry. Through the combined efforts of the ECFSPR staff and Executive Committee, in conjunction with the hard work of the members of the individual centres and countries that volunteer so much of their time, data of almost 40,000 patients has been uploaded to the ECFSPR, a considerable accomplishment which has hugely improved the value of the Registry as a tool for research and quality improvement. For this, we at the ECFSPR are very grateful.

Finally, I would like to thank all the people with CF throughout Europe for their willingness to participate in the ECFSPR. Without them, this Registry would not exist. We hope that the Registry's information is useful for people with CF, their families and caregivers and that it will lead to improved CF care throughout Europe.

Sincerely,

Edward F. McKone, MD, FRCPI
ECFSPR Director

To the people with cystic fibrosis

This report is about you and how cystic fibrosis (CF) affects you and other people all over Europe. The Report is based on information collected by individual CF centres and the national CF registries that participate in the European Cystic Fibrosis Society Patient Registry (ECFSPR). We have tried to make the presentation of this data as clear as possible and hope that you will find this report interesting and easy to understand.

From this year on we will publish the results of the ECFSPR Report in a separate short report where you will see the information that might be of interest to you “at-a-glance”.

If there is something that is unclear, or if you have ideas on how to do it better next year you are welcome to contact us. You can contact us by email: ecfs-pr@uzleuven.be.

For discussions about the results in your country we encourage you to contact your own CF centre.

You will find more information about the ECFSPR on the patient-dedicated page of our website, www.ecfs.eu/projects/ecfs-patient-registry/information-about-ecfspr-cf-patients.

List of centres and national registries that provided the data

Country	Centre/National Registry name	Contact
Austria	9 individual centres:	Thomas Frischer
	LKH-Univ. Klinikum Graz, Universitätsklinik für Kinder- und Jugendheilkunde, Klinische Abteilung für Pädiatrische Pulmologie und Allergologie, Graz	Ernst Eber Maria Wagenhofer
	Medizinische Universität Innsbruck, Departement für Kinder- und Jugendheilkunde, CF Zentrum für Kinder, Jugendliche und Erwachsene, Innsbruck	Helmut Ellemunter
	Klinikum Klagenfurt am Wörthersee, Abteilung für Kinder- und Jugendheilkunde, Pädiatrische Pulmologie/Allergologie, Klagenfurt	Franz Hubert Wadlegger
	Kardinal Schwarzenberg'sches Krankenhaus, Abteiling für Kinder- und Jugendmedizin, Schwarzach	Christoph Seelbach
	Landeskrankenhaus Steyr, Abteilung für Kinder- und Jugendheilkunde, Steyr	Josef Emhofer
	Universitätsklinik für Kinder- und Jugendheilkunde, Cystische Fibrose Ambulanz, Vienna	Sabine Renner Brigitte Mersi
	Wilhelminenspital, Abteilung für Kinder- und Jugendheilkunde mit Ambulanz, Vienna	*Thomas Frischer* *Ajibade Mogaji*
	Klinikum Wels-Grieskirchen, Abteilung für Kinder- und Jugendheilkunde, Wels	Elisabeth Steiner Vera Bauer Beatrix Wintersteiger Nadine Raffler
	Klinikum Wels-Grieskirchen, Abteilung für Lungenkrankheiten, Wels	*Helmut Feizelmeier*
Belgium	Belgian Cystic Fibrosis Registry	Muriel Thomas Simeon Wanyama
Czech Republic	Cystic Fibrosis Registry of the Czech Republic	Pavel Drevinek Milan Macek Alena Bilkova Marek Turnovec
Denmark	Cystic Fibrosis Registry of Denmark	Hanne Vebert Olesen Tania Pressler
France	Registre Français de la Mucoviscidose	Virginie Colomb Lydie Lemonnier
Germany	Qualitätssicherung Mukoviszidose	Lutz Nährlich Marguerite Honer Birgitt Wiese
Greece	1 individual centre:	Elpis Hatziagorou
	Aristotle University of Thessaloniki, Hippokration General Hospital, Cystic Fibrosis Centre, Thessaloniki	John Tsanakas Elpis Hatziagorou Maria Fotoulaki John Kioumis
Hungary	Cystic Fibrosis Registry of Hungary	Rita Ujhelyi Géza Marsal Attila Hornyák

Country	Centre/National Registry name	Contact
Ireland	Cystic Fibrosis Registry of Ireland	Godfrey Fletcher Abaigeal Jackson Shijun Zhou
Israel	Cystic Fibrosis Registry of Israel	Meir Mei-Zahav
Italy	Cystic Fibrosis Registry of Italy	Natalia Cirilli Gianluca Ferrari Patrizia Iansa Marco Salvatore
Latvia	1 individual centre:	Karina Mahlina
	Rīga Stradinš University, Children's Clinical University Hospital, Department of Pneumology, Riga	Vija Švabe Karina Mahlina
Lithuania	*1 individual centre:*	*Kęstutis Malakauskas*
	Hospital of Lithuanian University of Health Sciences, Kaunas Clinics, Adult Cystic Fibrosis Centre, Kaunas	*Kęstutis Malakauskas*
Republic of Macedonia	*1 individual centre:*	*Stojka Fustik*
	University Children's Hospital, Centre for Cystic Fibrosis, Skopje	*Stojka Fustik*
Republic of Moldova	Cystic Fibrosis Registry of Moldova	Svetlana Sciucca
The Netherlands	Dutch Cystic Fibrosis Registry	Vincent Gulmans
Portugal	6 individual centres:	Luísa Pereira
	Centro Hospitalar e Universitário de Coimbra, Pulmonology Department and Paediatric Unit, Coimbra	*Fernanda Gamboa* *Teresa Reis Silva*
	Hospital Dona Estefânia, Centro Hospitalar Lisboa Central, Cystic Fibrosis Centre, Lisbon	José Cavaco
	Hospital Santa Maria, Centro Hospitalar Lisboa Norte, Lisbon	Celeste Barreto Luísa Pereira Pilar Azevedo
	Centro Hospitalar do Porto, Paediatric Cystic Fibrosis Centre, Porto	*Telma Barbosa*
	Centro Hospitalar de S. João, Serviço de Pediatria, Porto	*Luísa Guedes Vaz*
	Centro Hospitalar de S. João, Adult Cystic Fibrosis Unit, Porto	*Adelina Azevedo Amorim*
Romania	*1 individual centre:*	*Simona Mosescu*
	Clinical Children's Hospital, Grigore Alexandresch, Bukarest, Romania	*Simona Mosescu*
Russian Federation	Cystic Fibrosis Registry of the Russian Federation	Nataliya Kashirskaya Alexander Chernyak Elena Amelina Stanislav Krasovskiy Elena Kondrtyeva Anna Voronkova
Serbia	1 individual centre:	Milan Rodic
	National Centre for Cystic Fibrosis, Mother and Child Health Institute of Serbia "Dr Vukan Cupic", Belgrade	Milan Rodic

Country	Centre/National Registry name	Contact
Slovakia	Cystic Fibrosis Registry of Slovakia	Hana Kayserova Mariá Drugdova
Slovenia	2 individual centres:	Uroš Krivec
	University Clinic of Pulmonary and Allergic Diseases, Golnik	Matjaž Fležar Andraz Jakelj Karmen Meško Meglič
	University Children`s Hospital, Pulmonary Department, Ljubljana	Uroš Krivec Ana Kotnik Pirs Jasna Rodnam Barbara Salobir
Spain	15 individual centres:	Carlos Vazquez-Cordero
	Hospital de Sabadell, Corporació Sanitària Parc Taulí, Clinica Pediàtrica, Unitat Clinica de Fibrosis Quìstica, Barcelona	Xavier Domingo Miró
	Hospital Sant Joan de Déu, Unitat de Pneumologia Pediàtrica i Fibrosi Quística, Barcelona	*Jordi Costa i Colomer*
	Hospital Vall d'Hebron, Unidad Fibrosis Quìstica e Neumologia Pediàtrica, Barcelona	Silvia Gartner
	Hospital Universitario La Princesa, Neumologia Adultos, Madrid	Rosa Maria Giron
	Hospital Niño Jesus, Unidad de Neumologia Pediàtrica, Madrid	Jose R. Villa Asensi
	Hospital Universitario de Ramón y Cajal, Unidad de Fibrosis Quìstica, Madrid	Adelaida Lamas Ferreiro
	Hospital 12 de Octubre, Unidad de Fibrosis Quìstica, Madrid	*Gloria Garcia Hernandez*
	Hospital Regional Universitario de Málaga, Unidad Fibrosis Quìstica Pediàtrica, Málaga	Francisco Javier Perez-Frias Estela Perez-Ruiz Pilar Caro-Aguilera
	Hospital Regionale Universitario de Málaga, Unidad Fibrosis Quìstica Adultos, Málaga	Casilda Olveira Fuster Gabriel Maria Olveira Fuster Nuria Porras Pèrez
	Hospital Universitario Virgen de la Arrixaca, Unidad de Fibrosis Quística, Murcia	*Pedro Mondéjar-López*
	Hospital Universitario Virgen del Rocío, Unidad de Fibrosis Quística, Sevilla	*Isabel Delgado Pecellín* *Esther Quintana Gallego*
	Hospital Universitario de Valencia, Unidad de Gastroenterologia Pediàtrica y Unidad de Neumologia Infantil/Fibrosis Quìstica, Valencia	Amparo Escribano Montaner Silvia Castillo
	Hospital Universitario La Fe, Unidad de Trasplante Pulmonar y Fibrosis Quìstica, Valencia	Amparo Solé Jover Carmen Inés Perez Munoz
	Hospital Universitario de Cruces, Unidad de Neumologia Pediatrica/Fibrosis Quìstica, Vizkaya	Carlos Vazquez Cordero
	Hospital Universitario Miguel Servet, Neumología del servicio de Pediatría, Zaragoza	*Carlos Martín de Vicente*
Sweden	Cystic Fibrosis Registry of Sweden	Isabelle de Monestrol Anders Lindblad

Country	Centre/National Registry name	Contact
Switzerland	12 individual centres:	Andreas Jung
	Kantonsspital Aarau AG, Klinik für Kinder und Jugendliche, Abteilung pädiatrische Pneumologie, Allergologie und Immunologie, Aarau	*Dominik Müller-Suter*
	Kantonsspital Aarau AG, Klinik für Pneumologie und Schlafmedizin, Aarau	*Sarosh Irani*
	Lindenhofspital Bern, Praxis für Pneumologie "Quartier Bleu", Bern	Reta Fischer Carlo Mordasini
	Universitätsklinik für Kinderheilkunde, Zentrum für Cystische Fibrose und Pulmonologie, Inselspital, Bern	Carmen Casaulta Philipp Latzin
	Hôpital Cantonal Fribourg, Pädiatrie, Fribourg	*Denise Herzog* *Johannes Wildhaber*
	Hôpitaux Universitaires de Genève, Département de l'enfant et de l'adolescent, Unité de Pneumologie Pédiatrique, Genève	*Anne Mornand*
	Centre Hospitalier Universitaire Vaudois (CHUV), Départment Médico-Chirurgical de Pédiatrie, Pneumologie Pédiatrique et Mucoviscidose, Lausanne	Gaudenz Hafen
	Centre Hospitalier Universitaire Vaudois (CHUV), Policlinique Médicale Universitaire, Départment de Médecine, Consultation Adulte de Mucoviscidose, Lausanne	Laurent Nicod Marie Hofer
	Luzerner Kantonsspital, Zentrum für Zystische Fibrose für Kinder und Erwachsene, Abteilungen für Pneumologie, pädiatrische Pneumologie und pädiatrische Gastroenterologie, Luzern	Bernhard Schwizer Nicolas Regamey Johannes Spalinger
	Hôpital de Morges, Consultation de Mucoviscidose Adulte, Morges	Alain Sauty Marie Hofer
	Ostschweizer Kinderspital, Pädiatrische Pneumologie und CF-Zentrum, St. Gallen	Jürg Barben
	Universitäts-Kinderspital Zürich, Abteilung für Pneumologie, Zürich	Andreas Jung Romy Rodriguez
	Universitätsspital Zürich, Klinik für Pneumologie, Adultes CF Zentrum, Zürich	*Christian Benden* *Thomas Kurowski*
Ukraine	*1 individual centre:*	*Halyna Makukh*
	SI "Institute of Hereditary Pathology of Ukranian National Medical Academy", Lviv	*Halyna Makukh*
United Kingdom	UK Cystic Fibrosis Registry	Rebecca Cosgriff Elaine Gunn Siobhán Carr

List of individual centres and national registries who contributed to the ECFSPR. New participants since the last report of 2010 data are in italics. Where the name is in large print, the person is the country representative in the ECFSPR Steering Group; where the name is underlined, he/she is the database manager for the national registry.

Authors

For this report, the tables and graphs were written, commented and/or revised by:

Anna Zolin, Italy, ECFSPR Statistician, Department of Clinical Sciences and Community Health, University of Milan;
Jacqui van Rens, Belgium, ECFSPR Executive Coordinator;
Alice Fox and **Patrizia Iansa**, Italy, ECFSPR Service Desk;
Ulrike Pypops, Belgium: CF Europe representative in the ECFSPR;
Vincent Gulmans, The Netherlands, **Andreas Jung**, Switzerland, **Rebecca Cosgriff**, United Kingdom, **Anil Mehta**, United Kingdom: members of the ECFSPR Executive Committee;
Contributing country managers and national representatives (the names are listed on page 6);
Edward McKone, Ireland, ECFSPR Director.

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ECFSPR Annual Report 2013, Zolin A, McKone EF, van Rens J et al.

Introduction

The European Cystic Fibrosis Society Patient Registry (ECFSPR)

The ECFSPR collects demographic and clinical data of consenting cystic fibrosis (CF) patients from Europe and neighbouring countries. Data is collected using a common set of variables and definitions, and is sent to the ECFSPR in one of the following ways:

- National CF registries (or individual centres with local databases) extract patient data from their own database and import the data into the ECFSPR software;
- Individual centres enter patient data directly into the ECFSPR software.

Collection of data at a local level must be approved by local data protection authorities in accordance with European data protection legislation. Data stored in the central database is anonymous, and only year/month of birth and random centre numbers are used as identifiers. Data is available for scientific purposes on application. All requests are reviewed by the ECFSPR Scientific Committee and, based on their recommendation, the country representatives in the Steering Group (composed of national representatives of the countries that contribute data to the ECFSPR) decide if the data request is to be approved or not; this decision is final. Requests originating from the Industry are also reviewed by the ECFS Clinical Trials Network. All applications must meet the European and individual country data protection legislation regarding patient anonymity.

For more information, please visit our website www.ecfs.eu/projects/ecfs-patient-registry/intro.

General Considerations

For the national registries, it is possible that some of their definitions and data coding do not fully correspond to those employed by the ECFSPR, either because some types of information are not collected, or are collected in a different way by the national registry. When the national registries upload their data they are also asked to state in a document whether their variables definitions meet those of the ECFSPR. If major discrepancies between the definitions are present, those variables have been omitted from the annual report, or in the case of minor discrepancies, a footnote has been added to the graphs and tables that explains the difference. For example, the ECFSPR collects information on the presence of chronic *Pseudomonas aeruginosa* infection according to the modified Leeds criteria and/or the presence of elevated *Pseudomonas* antibodies (see Appendix 2 on page 120). If a national registry collects such information as “at least one positive *Pseudomonas aeruginosa* culture this year”, this information would be too different from the ECFSPR definition of chronic *Pseudomonas aeruginosa*, and we would set this variable to “missing” for that particular country. If, instead, a country defined chronic *Pseudomonas aeruginosa* as “the presence of more than four positive cultures in 6 months”, the data of this variable would be included in the annual report since the definition is much closer to the ECFSPR definition. Where this is the case, a footnote has been added to the relevant tables and graphs.

If a country does not collect a certain variable (or if it is completely different from the ECFSPR definitions as described above), we have omitted that country from the relevant graphs in the report. The same applies for countries where the information for more than 10% of the patients is missing. All data, however, is presented

in the tables. The number of missing values is important for the interpretation of the results, since it is impossible to know if a patient with a missing value for a given complication has this complication or not, which makes the given frequencies less accurate. For example, in a country where 7% of the patients have liver disease, but 20% of patients have unknown/missing information on liver disease, the true frequency of liver disease can be anything between 7 and 27%.

You will find some differences between the findings of the national registries' own reports and the ECFSPR report. This is because some variables are recoded or computed in different ways. For example, some national registries compute the age at the annual visit and consider 16 years as the cut-off for adult age. The ECFSPR computes the age at FEV_1/height/weight measurement and the age at follow-up (the end of the year) and considers 18 years as cut-off for adult age. Since clinical outcomes do not change very much over a 12 month period, we do not consider this to be a serious obstacle to interpretation. Another example: for lung function values such as FEV_1, the raw data values, reported in litres, are not informative unless they are expressed in relation to the age, sex and height of the patient. We therefore needed to transform the raw values into new variables in order to compare lung function between patients and countries. We used common reference populations (one for children and one for adults) for all data when calculating the values as a percentage of predicted from the raw data. Slightly different values can be obtained when using another reference population on the same raw data. It is important to use a common method of calculation when comparing different countries, just as the national registries choose a common method of calculation when they compare the individual centres in that country.

Glossary and Abbreviations

Country codes:

AT:	Austria
BE:	Belgium
CH:	Switzerland
CZ:	Czech Republic
DK:	Denmark
DE:	Germany
ES:	Spain
FR:	France
GR:	Greece
HU:	Hungary
IE:	Ireland
IL:	Israel
IT:	Italy
LT:	Lithuania
LV:	Latvia
MD:	Republic of Moldova
MK:	Republic of Macedonia
NL:	The Netherlands
PT:	Portugal
RO:	Romania
RS:	Serbia
RU:	Russian Federation
SE:	Sweden
SI:	Slovenia
SK:	Slovak Republic
UA:	Ukraine
UK:	United Kingdom

Explanation of terms:

ABPA: allergic bronchopulmonary aspergillosis, an allergic reaction to the mould *Aspergillus.*
BMI: body mass index (weight (kg)/(height (m))^2).
Bronchodilator: medication that relaxes the muscles of the airways, used also for asthma.
CFRD: CF related diabetes.
CFTR: CF transmembrane conductance regulator, is a protein at the cell surface that controls the salt and water balance across a cell. The gene that causes CF is the blueprint for the CFTR protein. Everyone has two copies of the gene for CFTR, but to be born with CF, both CFTR genes must be affected by a CF-causing mutation.
FEV_1: forced expiratory volume in one second (lung function parameter).
FEV_1%: the FEV_1 as a percentage of the average value for healthy people of the same age, height and sex.
Haemoptysis: coughing up blood. This happens frequently in small amounts in CF, so the complication we asked for here is major bleeding (more than 250 ml).
Homozygous: CF is caused by mutations of the CFTR gene, one on each allele. One is inherited from the mother and one from the father. If both mutations are the same, the person is said to be homozygous for this mutation.
Heterozygous: CF is caused by mutations of the CFTR gene, one on each allele. One is inherited from the mother and one from the father. If these are two different mutations, the person is considered to be heterozygous.
Max: maximum. It is the highest value.
Mean: it is the average value of a set of measurements. For example, if the mean age at diagnosis is 3 years, it means that, on average, the patients are diagnosed when they are 3 years old.
Meconium ileus: congenital obstruction of the gut with thick, sticky faeces.
Median: the value that separates the set of measurements in two halves, so that 50% of measurements are below the median value and the other 50% of measurements are above the median value. For example, if median age at diagnosis is 5 months, it means that half of the patients are diagnosed before 5 months of age, and the other half of the patients are diagnosed after 5 months of age.
Min: minimum. It is the lowest value.
N: the number of patients in a group for whom the information is not missing.
N miss: number of missing values. It is the number of patients for whom the information was missing.
NaCl: sodium chloride. Here: inhaled hypertonic saline.
Pancreatic insufficiency: the absence of pancreatic enzymes in the gut leading to malnutrition if not treated (pancreatic insufficiency is therefore defined as the use of pancreatic enzyme supplementation).
25th Pctl: 25th percentile, also called first quartile. It is the value that separates the set of measurements in two parts, so that one quarter (25%) of the measurements is below it and the other three quarters are above it. For example, if the 25th percentile for age at diagnosis is 1 month, it means that a quarter of the patients are diagnosed before 1 month of age, and the other three quarters are diagnosed after 1 month of age.
75th Pctl: 75th percentile, also called third quartile. It is the value that separates the set of measurements in two parts, so that three quarters (75%) are below it and the other quarter is above it. For example, if the 75th percentile for age at diagnosis is 3 years, it means that three quarters of the patients are diagnosed before 3 years, the other quarter are diagnosed after 3 years.
Pneumothorax: collapsed lung, in CF usually because of severe lung damage.
Quartiles: The 25th Percentile, the median (the 50th Percentile) and the 75th percentile are collectively called quartiles, because they divide the set of measurements into quarters.
rhDNase: ribosomal human DNase – marketed as Pulmozyme®.
Z-score: it indicates how far a value is from the mean value of a reference population (see Appendix 1 for details). Negative z-scores mean that the value is below the mean of values in the reference population, whereas positive z-scores mean that the value is above the mean. For example, a z-score for weight of -2 means that the weight is 2 standard deviations below the mean of subjects of the same age and sex of the reference population. For example, if the z-score for BMI of a 10 year old boy is -2, it means that the BMI for that boy is 2 standard deviations below the mean BMI of 10 year old boys of the reference population.

Summary of data report

Outcome		Females	Males	Total
Patients registered in the ECFSPR	n	18455	20526	38985*
	(%)	(47.3)	(52.7)	
Age at follow-up (in years, patients alive on 31/12/2013)	mean	19.6	20.5	20.1
	median	17.8	19.0	18.4
Patients ≥ 18 years (patients alive on 31/12/2013)	%	49.3	52.4	50.9
Age at diagnosis**	mean (years)	4.2	4.0	4.1
	median (months)	3.6	3.6	3.6
Patients with at least one F508del allele**	%	82.4	82.5	82.5
Patients living with lung transplant**	n	830	844	1674
	(%)	(5.5)	(5.1)	(5.3)
Patients living with liver transplant**	n	59	116	175
	(%)	(0.4)	(0.7)	(0.6)
Patients deceased in 2013***	n	177	170	347
	(%)	(1.1)	(1.0)	(1.0)
Age at death (years)***	mean	28.4	30.4	29.4
	median	26.0	29.0	27.0

* For demographic purposes, German 2010 data (N=5,003) has been included in this total. Gender is unknown for 4 patients.

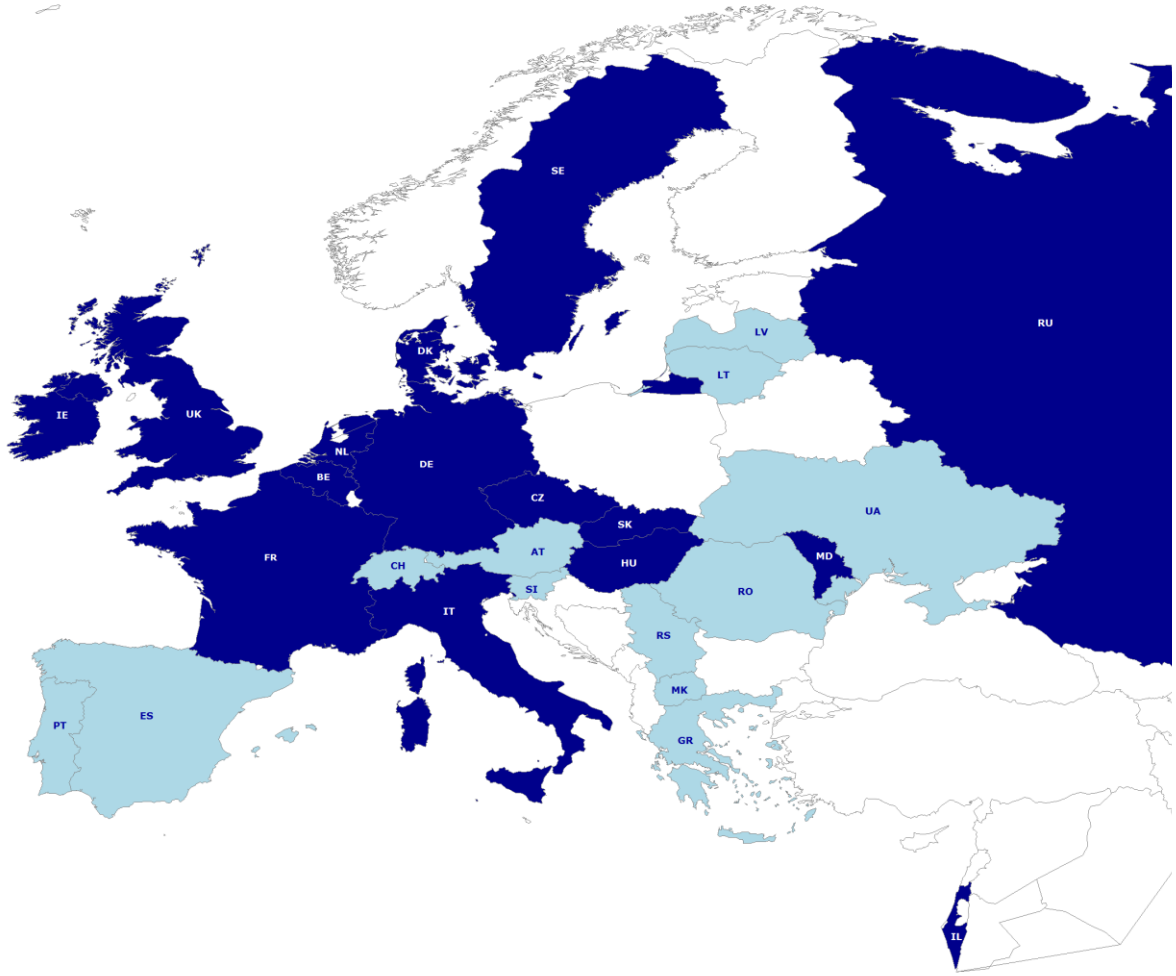
** Only patients seen during the year are presented; German 2010 data (N=5,003) is excluded. The total number of patients presented is 31,948.

*** Only patients seen during the year are presented; German 2010 data (N=5,003) is excluded. For the United Kingdom, all patients with confirmed diagnosis of CF are included (N=10,336). The total number of patients presented is 33,234.

Data report

1. Demographics

Figure 1.1 Map of countries that contributed to the ECFSPR in year 2013.



Countries that sent their data to the ECFSPR as a national registry are in dark blue, countries with individual centres that sent their data are in light blue.

Table 1.1 Number of patients in year 2013, by country.

Country	Patients registered, not lost to follow-up	Patients seen	Estimated coverage 2013
Austria	579	532	85%
Belgium*	1186	1153	>90%
Czech Republic*	588	588	100%
Denmark*	481	466	100%
France*	6286	6286	90%
Germany*	5003	5003	95%[1]
Greece	116	98	20%
Hungary*	510	506	90%
Ireland*	1208	1063	93%
Israel**	636	529	98%
Italy*	4771	4771	93%
Latvia	36	35	>90%
Lithuania	13	13	20%[2]
Rep of Macedonia	101	98	>90%
Rep of Moldova*	61	61	68-76%
The Netherlands*	1359	1341	98%
Portugal	317	256	>95%
Romania	41	41	11%
Russian Federation*	1980	1922	62%
Serbia	166	154	>90%
Slovak Republic**	229	149	>90%
Slovenia	93	81	>95%
Spain	1459	1374	40%
Sweden*	614	614	95%
Switzerland	707	662	74%
Ukraine	109	105	13%[3]
United Kingdom*	10336	9050	99%[4]
Total	38985	36951	

* Countries with an established national CF registry.

** These countries have a national registry, but use the direct data-entry function of ECFSTracker.

[1] Data are from 2010 and presented for demographic purposes. The 2013 data will be submitted during the year 2016.

[2] Coverage is 100% for adults and 0% for children.

[3] Data referred to is from 2011.

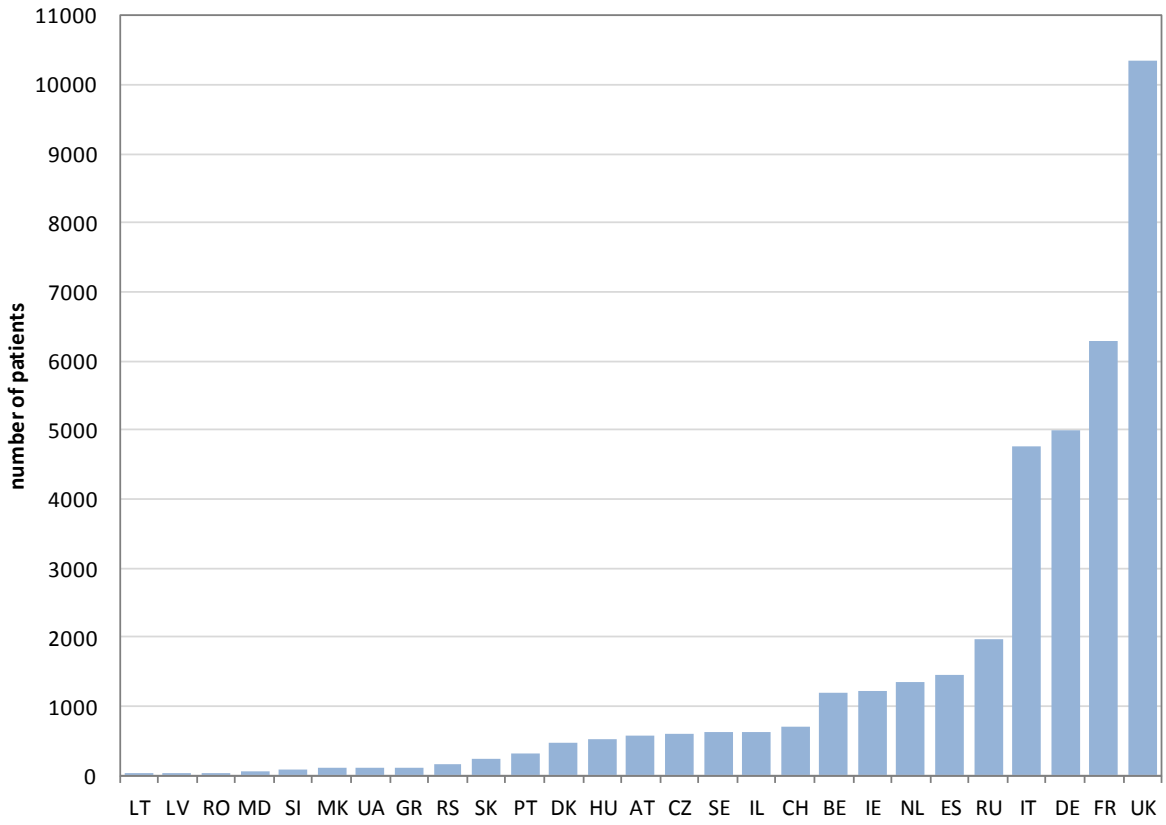
[4] The total number for UK is two patients less than the 2013 UK annual report due to the removal of CF diagnosis.

The column “Patients registered, not lost to follow-up” shows the patients that attend centres, and includes patients that have not been seen during the year but are known to be alive that year. The column “patients seen” presents only the patients who have attended the clinic during the year. The column “Estimated coverage 2013” shows the estimated percentage of CF patients living in that country who are

included in the national registries/national data collections as reported by the country. For some countries one individual centre may include almost all patients, e.g. Latvia and Serbia.

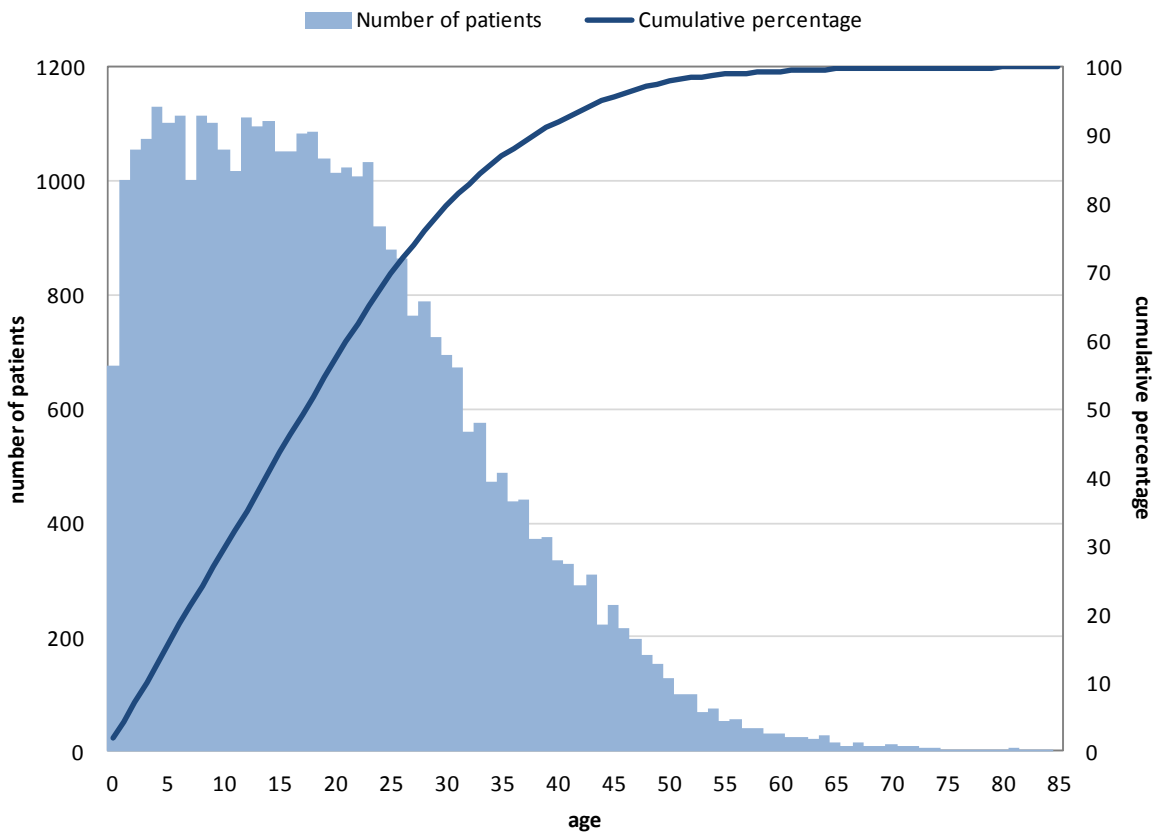
In all subsequent tables and graphs, the data referred to is for 2013, except for Ukraine, for which 2011 data was used, and for Germany, for which the data referred to is for 2010. The German 2010 data is shown for demographic purposes and presented only in the demographic section.

Figure 1.2 Number of patients registered in the ECFSPR in year 2013, by country.



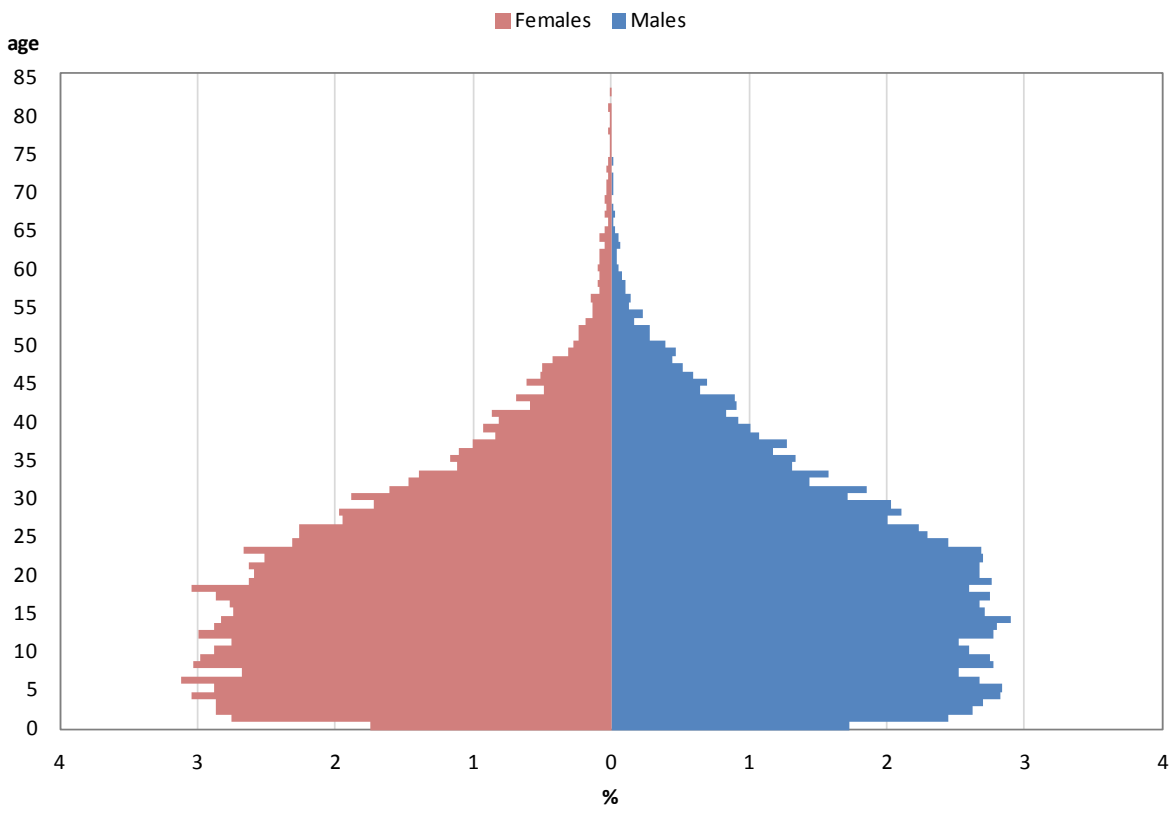
Each vertical bar shows the number of patients living in that country in 2013. Please refer to table 1.1 for the coverage in each country.

Figure 1.3 Age at follow-up distribution. Patients alive on 31/12/2013.



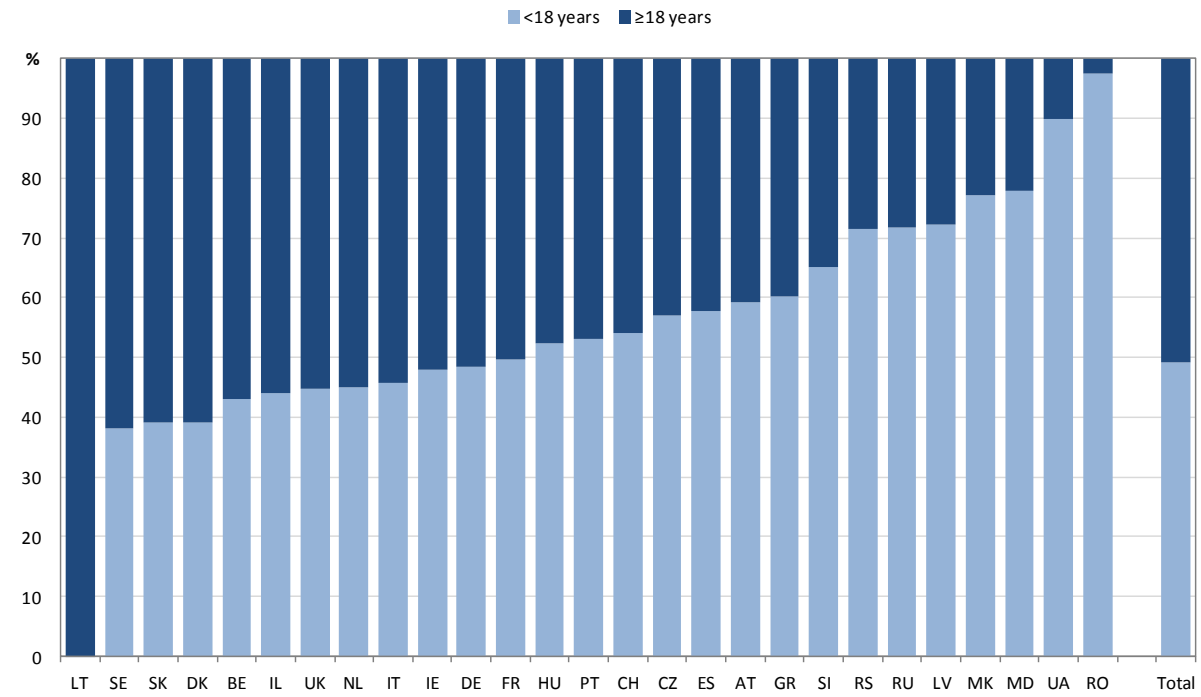
Each blue vertical bar represents the number of patients of that age alive in 2013. The cumulative percentage (the dark blue line) describes how many patients (as a percentage) are below a certain age (e.g. 50% of the patients are younger than 18 years of age).

Figure 1.4 Age at follow-up distribution by sex. Patients alive on 31/12/2013.



The pyramid shows the percentage of patients of different ages as horizontal bars. The right hand side of the pyramid (blue) shows, for males, how many patients (as a percentage) are a certain age, the left hand side (red) shows the same for females. The lower percentage of patients at the bottom of the pyramid is due to the fact that some patients have not yet been diagnosed (mean age at diagnosis is 4.08 years, see table 2.1).

Figure 1.5 Proportion of adults (≥18 years) and children (<18 years). Patients alive on 31/12/2013.



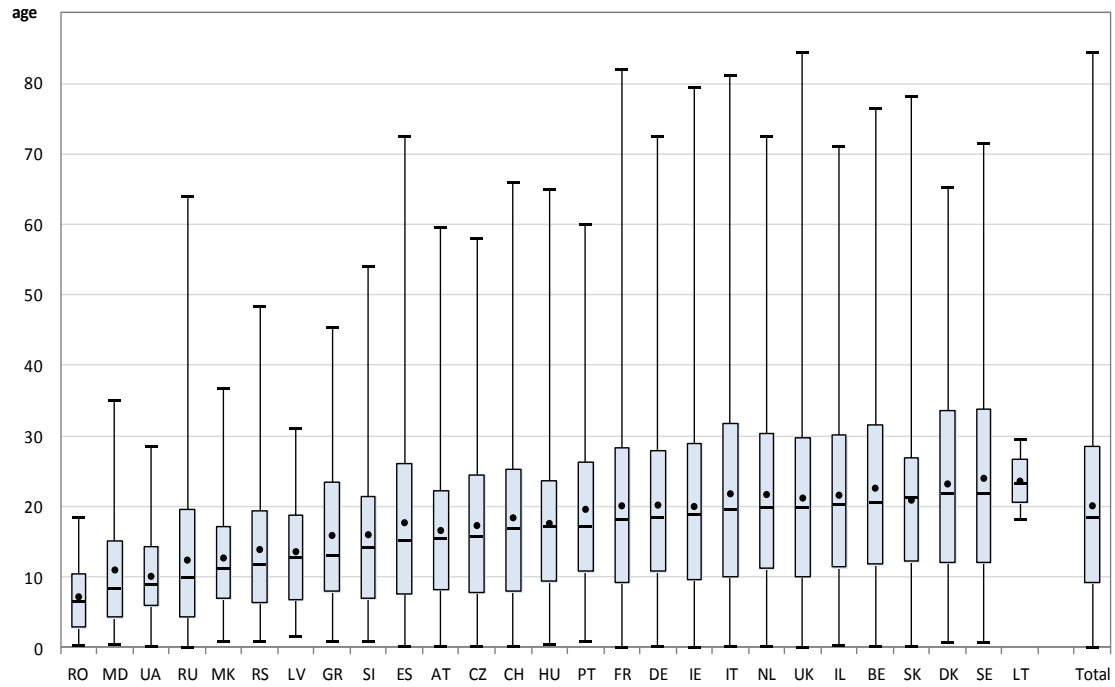
This graph shows the percentage of patients in each country who are adults (dark blue) or children (light blue). The percentage of adult patients varies considerably between the different countries, but this is partly an effect of the way the patients are included: for some countries only a few individual centres sent data to the ECFSPR, and the proportion of children and adults may reflect the proportion of paediatric and adult centres in that country who participate in the ECFSPR. Please refer to table 1.1 for national coverage.

Table 1.2 Age at follow-up: descriptive statistics, by country and overall. Patients alive on 31/12/2013.

Country	N	Mean (average age)	Min (age of the youngest patient)	25th pctl (25% of the patients are younger than this age)	Median (half the patients are younger than this age)	75th pctl (75% of the patients are younger than this age)	Max (age of the oldest patient)
Austria	576	16.6	0.1	8.2	15.5	22.3	59.5
Belgium	1181	22.6	0.2	11.9	20.5	31.5	76.5
Czech Republic	581	17.3	0.1	7.8	15.7	24.5	58.0
Denmark	478	23.2	0.7	12.0	21.9	33.7	65.3
France	6233	20.1	0.0	9.2	18.2	28.3	81.9
Germany	4959	20.2	0.1	10.8	18.5	28.0	72.5
Greece	116	15.9	0.9	8.0	13.0	23.5	45.4
Hungary	508	17.6	0.5	9.4	17.1	23.7	64.9
Ireland	1200	20.0	0.0	9.7	18.9	28.9	79.4
Israel	631	21.6	0.3	11.4	20.3	30.1	71.0
Italy	4739	21.8	0.2	10.1	19.6	31.8	81.1
Latvia	36	13.6	1.5	6.7	12.8	18.7	31.0
Lithuania	12	23.6	18.1	20.7	23.2	26.6	29.5
Rep of Macedonia	101	12.7	0.9	7.0	11.2	17.2	36.8
Rep of Moldova	59	11.0	0.5	4.3	8.4	15.1	35.1
The Netherlands	1341	21.7	0.1	11.2	19.8	30.4	72.5
Portugal	313	19.6	0.8	10.9	17.2	26.3	60.0
Romania	41	7.2	0.3	3.0	6.5	10.5	18.4
Russian Federation	1947	12.4	0.0	4.4	9.9	19.5	64.0
Serbia	165	13.9	0.8	6.4	11.8	19.4	48.4
Slovak Republic	228	20.9	0.1	12.2	21.3	26.8	78.2
Slovenia	92	16.0	0.8	7.0	14.2	21.5	54.0
Spain	1444	17.7	0.1	7.6	15.2	26.0	72.5
Sweden	610	24.0	0.7	12.1	21.9	33.8	71.5
Switzerland	705	18.4	0.1	8.0	16.9	25.2	66.0
Ukraine	108	10.1	0.2	5.9	9.0	14.4	28.5
United Kingdom	10190	21.2	0.0	10.0	19.9	29.8	84.4
Total	38594	20.1	0.0	9.3	18.4	28.5	84.4

This table shows the descriptive statistics for age at follow-up of the patients by country and overall. Only patients who were alive on December 31st 2013 are included.

Figure 1.6 Age at follow-up: box-plot, by country and overall. Patients alive on 31/12/2013.



This box-plot is a graphic representation of the age detailed in table 1.2. For each country the dash (black line crossing the blue box) is the median, the black dot is the mean and the whiskers (vertical lines with a T-shaped end) are the minimum and the maximum. The following figure explains how to read the box.

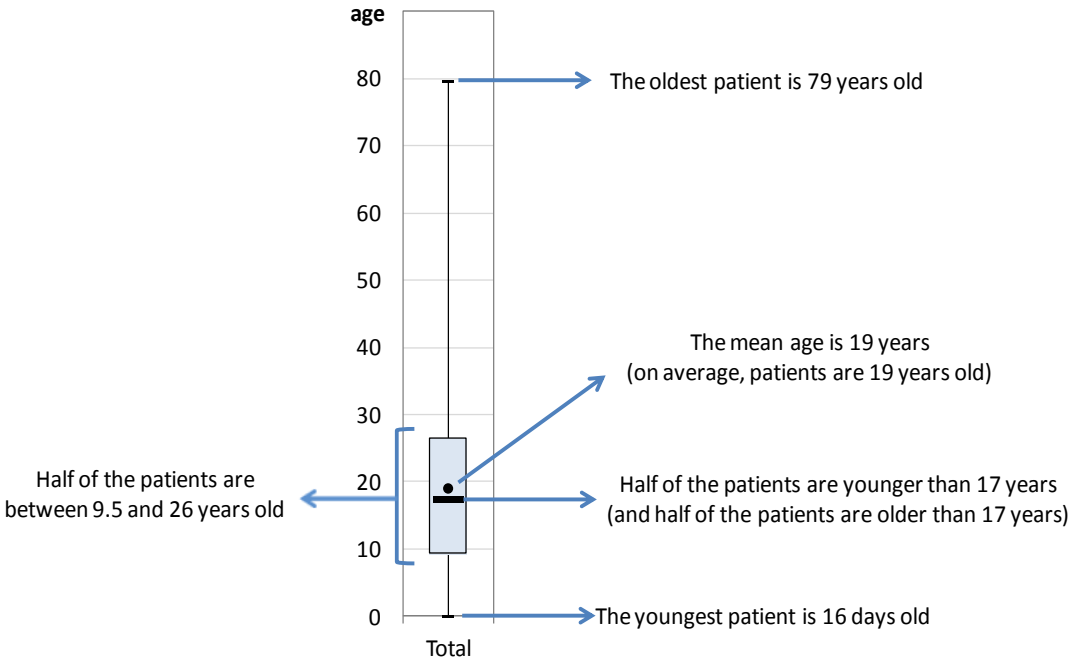
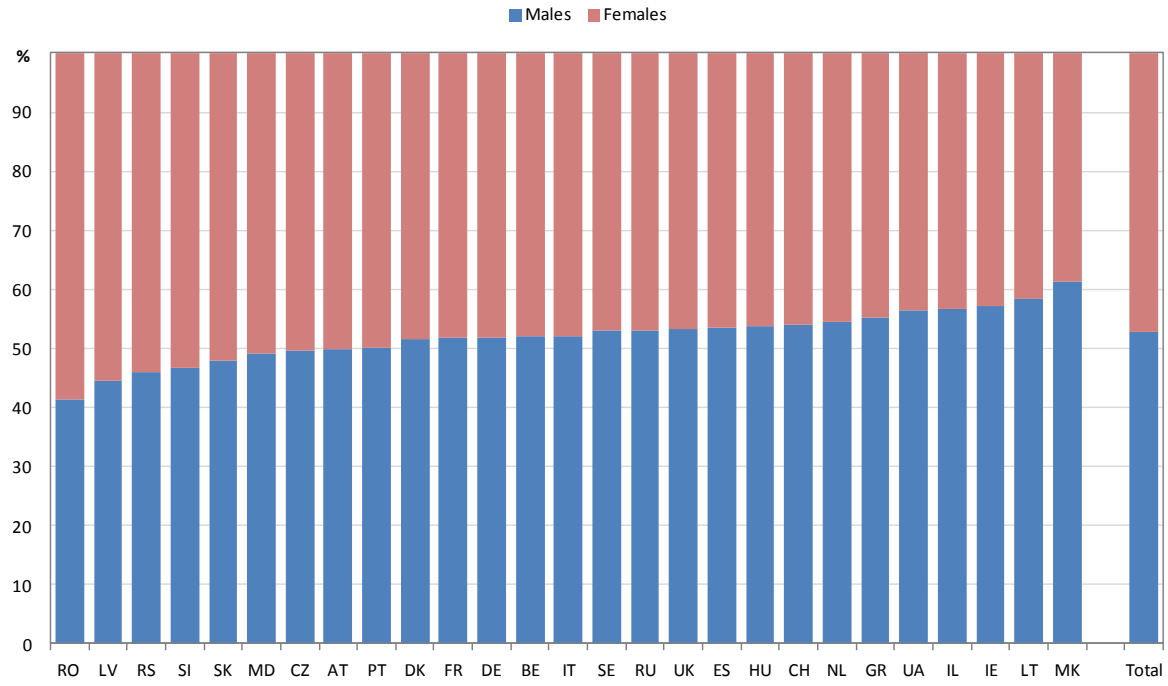
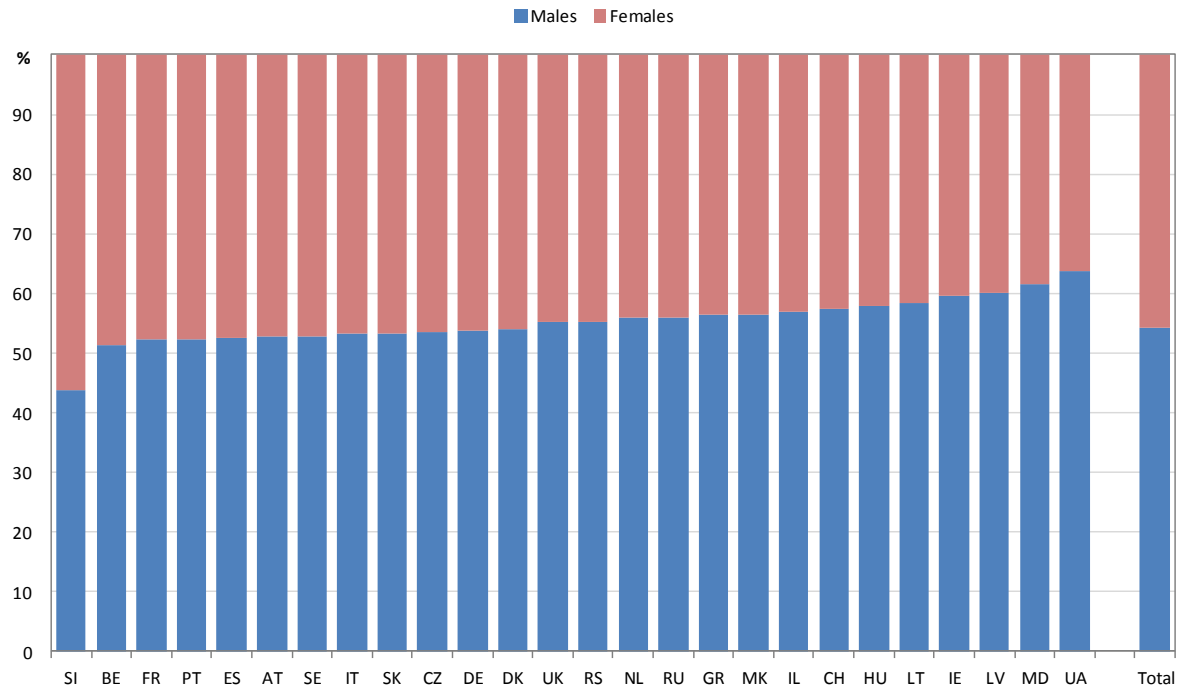


Figure 1.7 Sex distribution, by country and overall. Patients alive on 31/12/2013.



Sex distribution of all patients. Overall (see "Total"), in the ECFSPR there are more male than female patients, which could reflect higher mortality in female CF patients. The proportion is not uniform across the different countries.

Figure 1.8 Sex distribution, by country and overall. Patients alive on 31/12/2013 and aged 18 years or more.



Note: Romania has one adult (male) patient and is excluded from the graph.

Sex distribution for adult patients. The total proportion of females in the adult group is similar to the proportion of females in the whole population.

2. Diagnosis

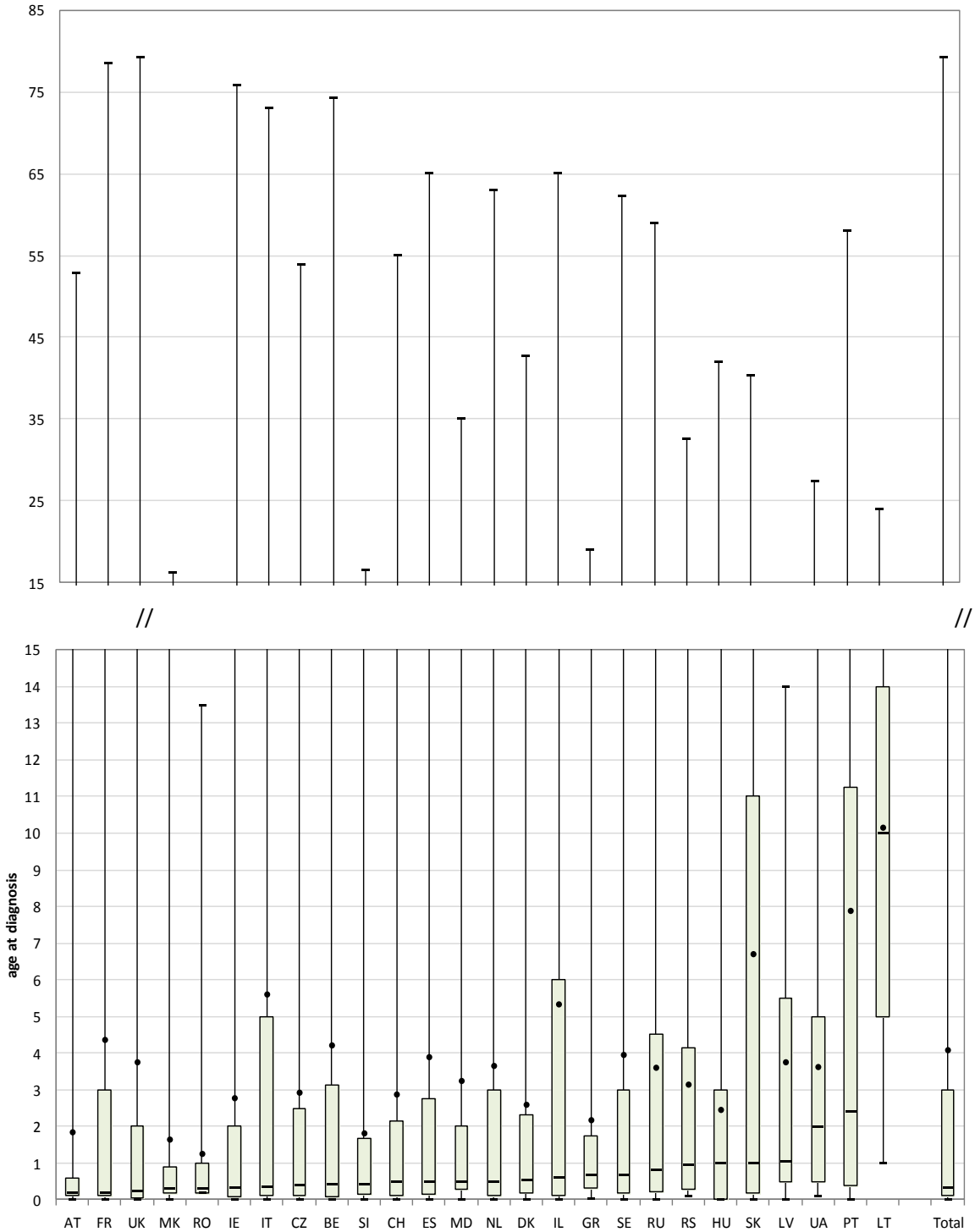
Hereafter, only patients seen during the year are presented and German 2010 data (N=5,003) is not included.

Table 2.1 Age at diagnosis (in years): descriptive statistics, by country and overall. All patients seen in 2013.

Country	N	N miss	Mean (average age at diagnosis)	Min (lowest age at diagnosis)	25th pctl (25 % of the patients were diagnosed before this age)	Median (half the patients were diagnosed before this age)	75th pctl (75% of the patients were diagnosed before this age)	Max (highest age at diagnosis)
Austria	497	35	1.84	0	0.10	0.20	0.60	52.81
Belgium	1153	0	4.21	0	0.09	0.43	3.12	74.20
Czech Republic	588	0	2.92	0	0.10	0.40	2.50	53.90
Denmark	466	0	2.59	0	0.17	0.54	2.33	42.67
France	5934	352	4.36	0	0.10	0.20	3.00	78.50
Greece	94	4	2.17	0.04	0.33	0.67	1.75	19.00
Hungary	368	138	2.45	0	0	1.00	3.00	42.00
Ireland	1058	5	2.77	0	0.07	0.33	2.00	75.83
Israel	525	4	5.33	0	0.10	0.60	6.00	65.00
Italy	4604	167	5.60	0	0.11	0.36	4.98	72.97
Latvia	34	1	3.75	0	0.50	1.04	5.50	14.00
Lithuania	13	0	10.15	1.00	5.00	10.00	14.00	24.00
Rep of Macedonia	98	0	1.64	0	0.20	0.30	0.90	16.20
Rep of Moldova	61	0	3.24	0	0.30	0.50	2.00	35.00
The Netherlands	1259	82	3.65	0	0.10	0.50	3.00	63.00
Portugal	248	8	7.88	0	0.40	2.40	11.25	58.00
Romania	41	0	1.25	0.20	0.20	0.30	1.00	13.50
Russian Federation	1919	3	3.60	0	0.21	0.82	4.53	58.95
Serbia	148	6	3.14	0.10	0.30	0.95	4.15	32.50
Slovak Republic	113	36	6.70	0	0.20	1.00	11.00	40.30
Slovenia	78	3	1.81	0	0.15	0.43	1.67	16.50
Spain	1321	53	3.89	0	0.16	0.50	2.75	65.00
Sweden	601	13	3.95	0	0.19	0.68	2.99	62.28
Switzerland	571	91	2.87	0	0.10	0.50	2.15	55.00
Ukraine	105	0	3.62	0.10	0.50	2.00	5.00	27.40
United Kingdom	8939	111	3.75	0	0.06	0.25	2.00	79.18
Total	30836	1112	4.08	0	0.10	0.34	3.00	79.18

This table shows the descriptive statistics for age at diagnosis by country and overall. For prenatal diagnoses (children diagnosed before birth), the age at diagnosis has been set to 0.

Figure 2.1 Age at diagnosis (in years): box-plot, by country and overall. All patients seen in 2013.



This box-plot is a graphic representation of age at diagnosis as detailed in table 2.1. For each country the dash (black line crossing the blue box) is the median, the black dot is the mean and the whiskers (vertical lines with a T-shaped end) are the minimum and the maximum. Please note that the vertical axis is interrupted to emphasise the change of scale in the upper part of the graph. The figure on the next page explains how to read the box.

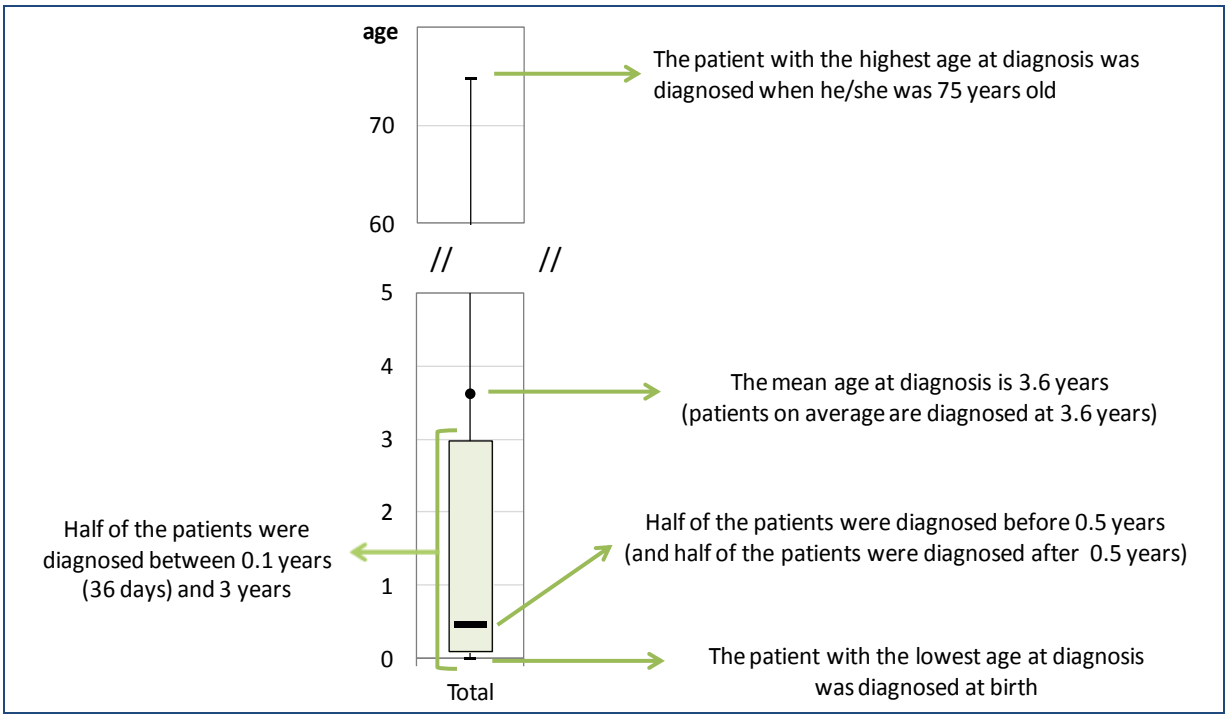
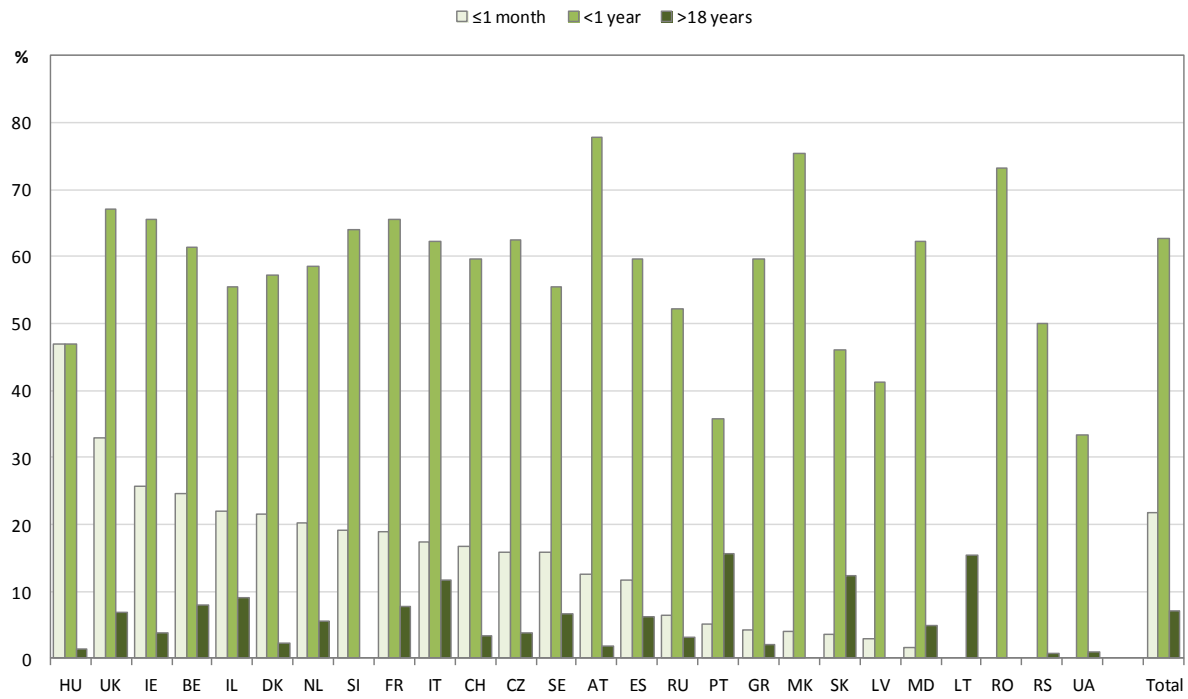
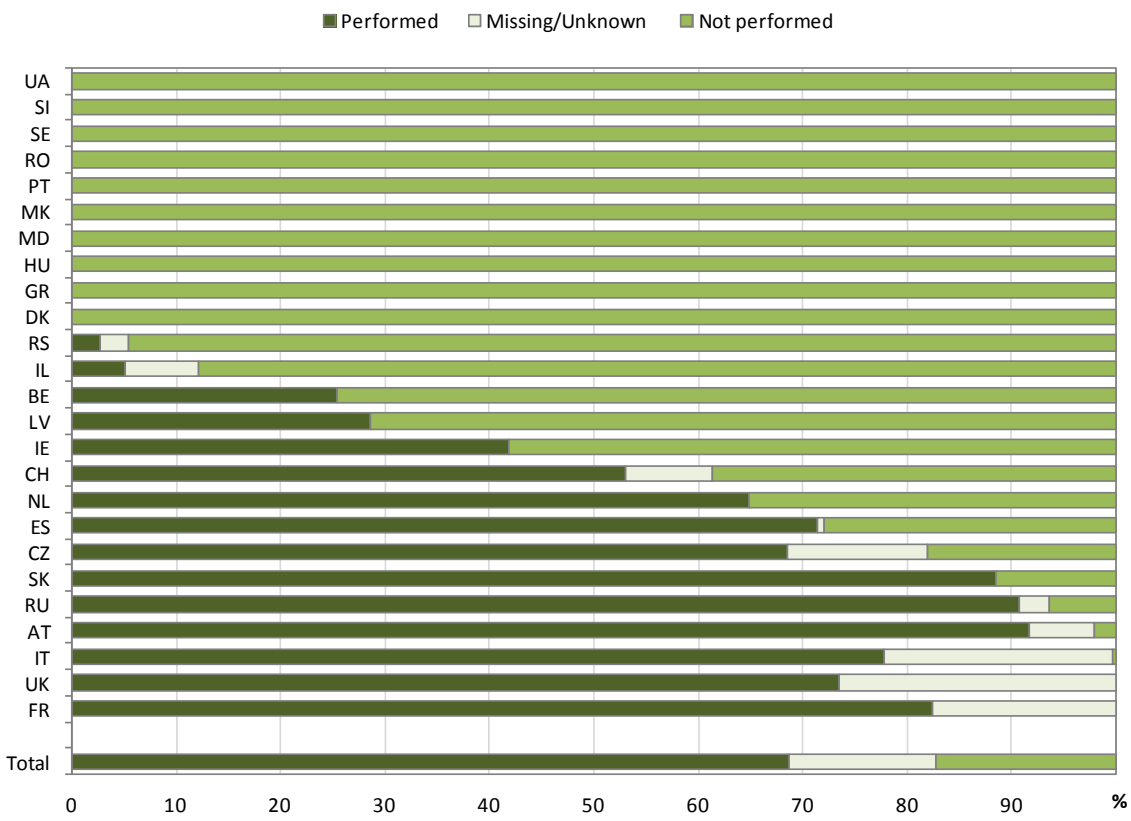

age
70
60
5
4
3
2
1
0
Total
The patient with the highest age at diagnosis was diagnosed when he/she was 75 years old
The mean age at diagnosis is 3.6 years (patients on average are diagnosed at 3.6 years)
Half of the patients were diagnosed between 0.1 years (36 days) and 3 years
Half of the patients were diagnosed before 0.5 years (and half of the patients were diagnosed after 0.5 years)
The patient with the lowest age at diagnosis was diagnosed at birth

Figure 2.2 Proportion of patients diagnosed at age 1 month or younger, younger than 1 year and older than 18 years, by country and overall. All patients seen in 2013.



This graphs shows age at diagnosis in subgroups. The vertical bars represent how many patients (as a percentage) were diagnosed within the first month of life (grey), within the first year of life (light green), and after 18 years of age (dark green). Note that the diagnoses included in the sub-group for within 1 month are also part of the diagnoses in the sub-group for within the first year, and that diagnoses between 1 year and 18 years are not shown in the graph, therefore the bars do not sum to 100%.

Figure 2.3 Proportion of patients who underwent neonatal screening, by country and overall. Patients 5 years old or younger seen in 2013.



Note: Belgium: no national neonatal screening programme. Positive answers ("neonatal screening performed") are reported when neonatal screening is one of the factors that led to CF diagnosis.
Czech Republic: positive answers ("neonatal screening performed") are reported when neonatal screening is one of the factors that led to CF diagnosis.
France: neonatal screening is recorded only if it is part of the diagnosis.
United Kingdom: diagnosis suggested by neonatal screening.

This graph shows the percentage of patients 5 years old or younger in 2013 who were screened at birth, (see country specific notes above). Dark green horizontal bars represent newborn screening "performed", light green ones "not performed". This graph shows that in some countries there is no newborn screening and that in others, in the five years previous to 2013, almost all the CF patients underwent newborn screening. In total, almost 70% of all children of 5 years old or younger registered in the ECFSPR in 2013 underwent newborn screening, but this estimate reflects the fact that not all the countries perform newborn screening.

Figure 2.4 Patients with meconium ileus, by country and overall. Patients aged 10 years or younger.

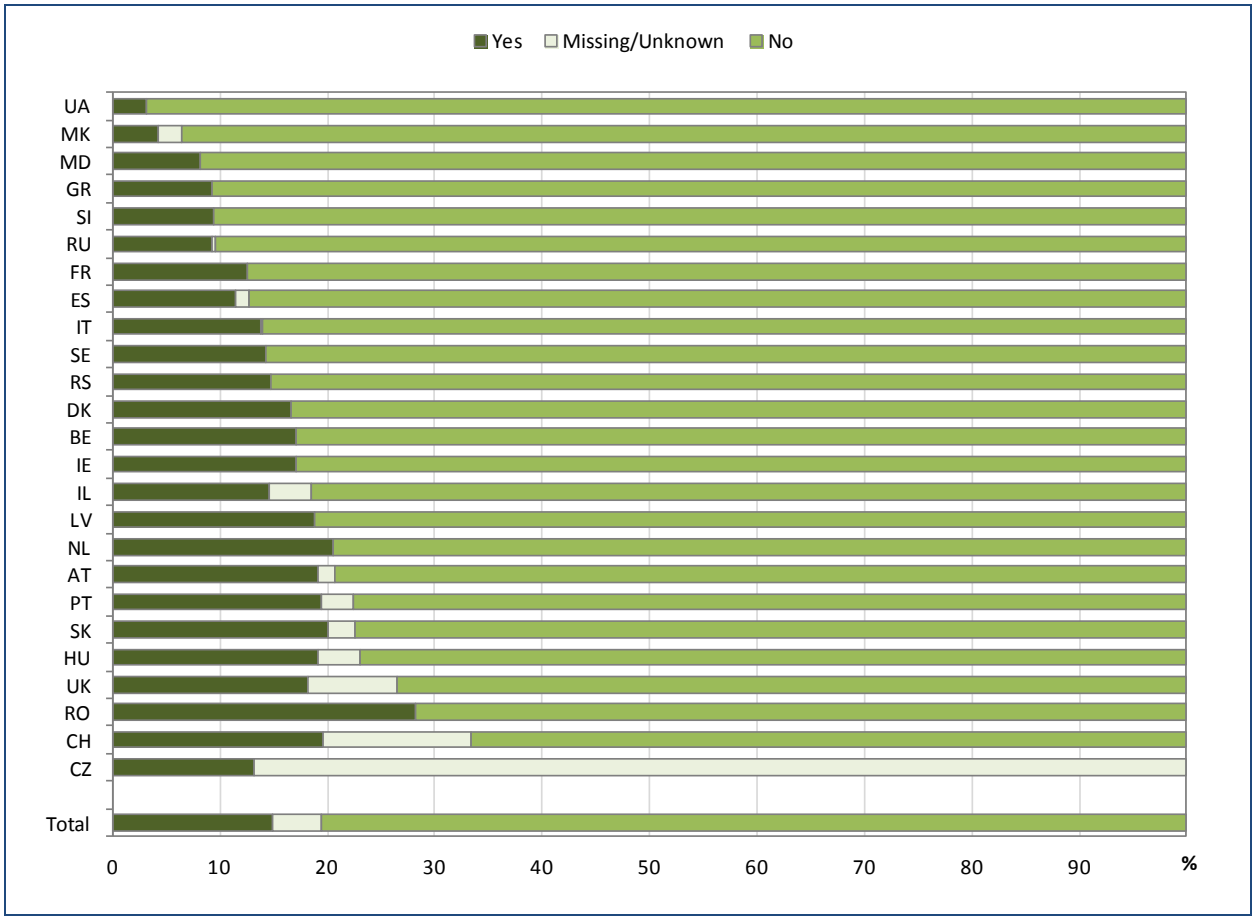
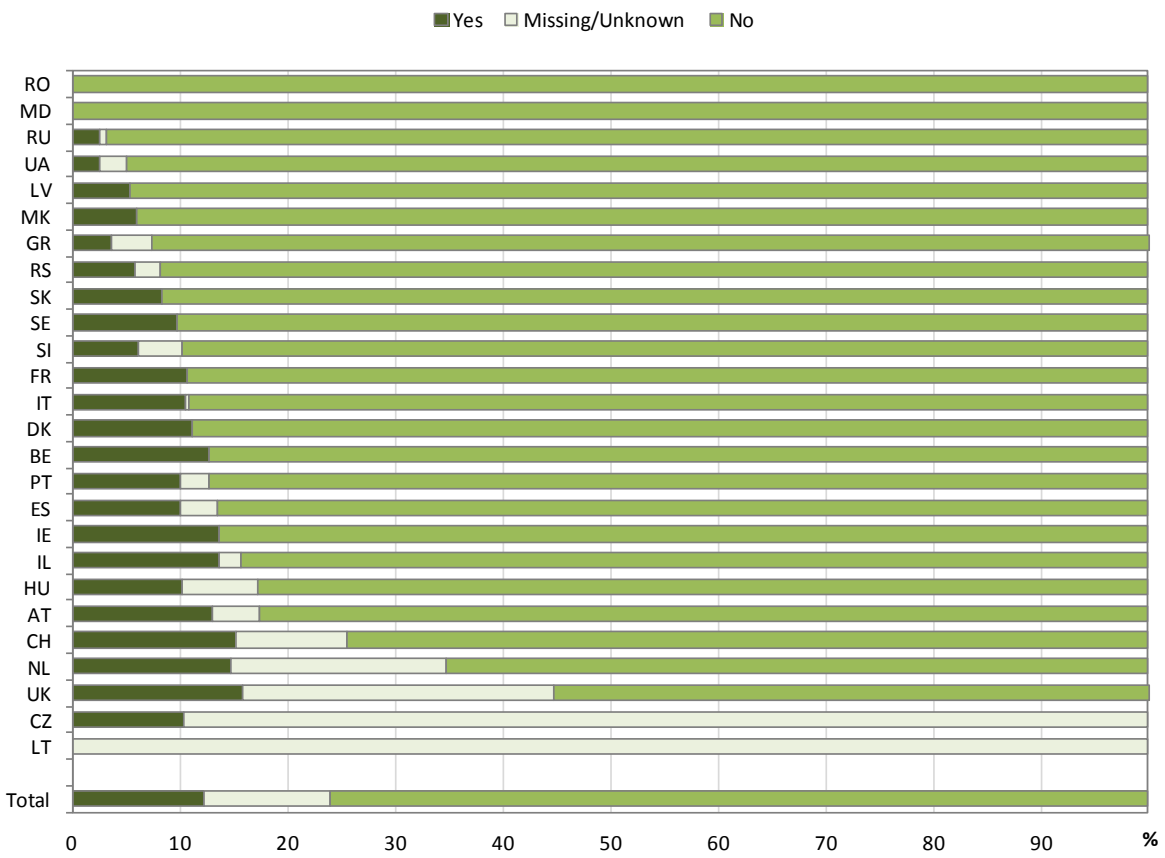


Figure 2.5 Patients with meconium ileus, by country and overall. Patients aged 11 years or older.



These two graphs show the prevalence of meconium ileus (operated or not) at birth in two age groups: 0 to 10 years (fig 2.4) and 11 years or older (fig 2.5). Overall, the proportion of child patients (≤10 years) with meconium ileus is higher compared to the older age group (>10 years). This difference is not due to an increase in the prevalence of meconium ileus in the younger generations but could be due to the fact that some older patients with meconium ileus have died, and are therefore not present in the current data collection (which refers to patients seen in 2013). The graphs also show that the frequency of reported meconium ileus varies between countries.

3. Genetics

Cystic fibrosis is caused by mutations of the 'CFTR' gene; one on each allele. One is inherited from the mother and one from the father. If both mutations are the same, the person is said to be homozygous for this mutation. If these are two different mutations, the person is considered to be heterozygous.

We supplied the countries with a list of the 1600 most common mutations based on the Cystic Fibrosis Mutation database (CFTR1). If the patient had a mutation that was not present in the database, the country had the possibility to enter the name of the mutation as free text. During the data cleaning process, the genotypes not on our list were checked for obvious misspellings or alternative names and, if identified as a known mutation, renamed. Although there are different naming conventions for mutations, we use the original mutation name (legacy name) in this report, since more than 90% of the mutations in the database use this nomenclature.

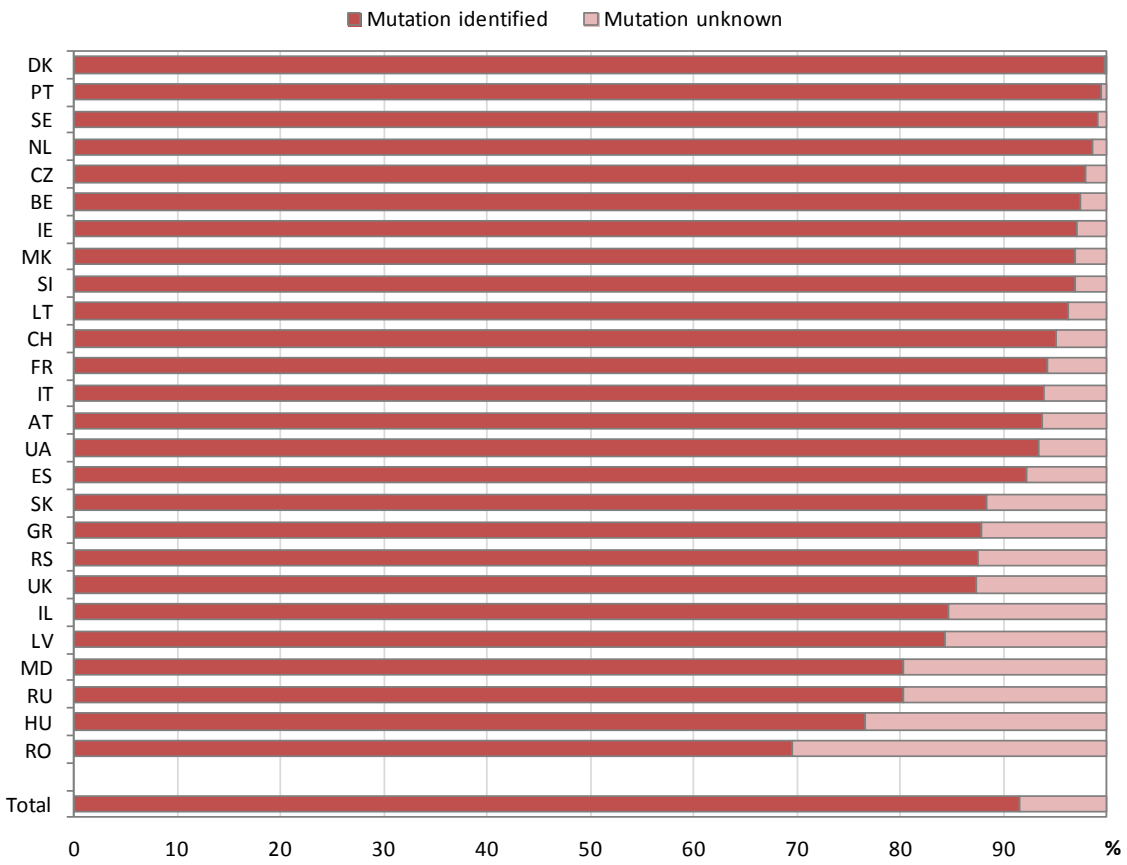
If DNA analysis to look for CFTR mutations was never carried out, we asked the countries to report "Not done" in the genotype field. If DNA analysis was done, but only one or no mutations were found, we asked the countries to write "Unknown" for the un-identified mutations. Please note that there are differences from country to country in how DNA testing is carried out; some countries use standard kits that test only a limited number of common mutations (e.g. 28), and other countries perform DNA analyses of the whole gene until the mutation is identified.

Table 3.1 Proportion of patients with DNA analysis and the result of this, by country and overall. All patients seen in 2013.

Country	N	Genotyping		Among genotyping done	
		not done number (%)	done number (%)	two mutations identified number (%)	at least one mutation unknown number (%)
Austria	532	2 (0.38)	530 (99.62)	480 (90.57)	50 (9.43)
Belgium	1153	1 (0.09)	1152 (99.91)	1103 (95.75)	49 (4.25)
Czech Republic	588	1 (0.17)	587 (99.83)	569 (96.93)	18 (3.07)
Denmark	466	0 (0)	466 (100)	465 (99.79)	1 (0.21)
France	6286	0 (0)	6286 (100)	5754 (91.54)	532 (8.46)
Greece	98	0 (0)	98 (100)	77 (78.57)	21 (21.43)
Hungary	506	10 (1.98)	496 (98.02)	324 (65.32)	172 (34.68)
Ireland	1063	0 (0)	1063 (100)	1017 (95.67)	46 (4.33)
Israel	529	1 (0.19)	528 (99.81)	423 (80.11)	105 (19.89)
Italy	4771	45 (0.94)	4726 (99.06)	4225 (89.40)	501 (10.60)
Latvia	35	0 (0)	35 (100)	24 (68.57)	11 (31.43)
Lithuania	13	0 (0)	13 (100)	12 (92.31)	1 (7.69)
Rep of Macedonia	98	0 (0)	98 (100)	93 (94.90)	5 (5.10)
Rep of Moldova	61	0 (0)	61 (100)	42 (68.85)	19 (31.15)
The Netherlands	1341	34 (2.54)	1307 (97.46)	1276 (97.63)	31 (2.37)
Portugal	256	2 (0.78)	254 (99.22)	251 (98.82)	3 (1.18)
Romania	41	0 (0)	41 (100)	24 (58.54)	17 (41.46)
Russian Federation	1922	208 (10.82)	1714 (89.18)	1164 (67.91)	550 (32.09)
Serbia	154	6 (3.90)	148 (96.10)	117 (79.05)	31 (20.95)
Slovak Republic	149	0 (0)	149 (100)	120 (80.54)	29 (19.46)
Slovenia	81	2 (2.47)	79 (97.53)	75 (94.94)	4 (5.06)
Spain	1374	3 (0.22)	1371 (99.78)	1187 (86.58)	184 (13.42)
Sweden	614	0 (0)	614 (100)	605 (98.53)	9 (1.47)
Switzerland	662	8 (1.21)	654 (98.79)	599 (91.59)	55 (8.41)
Ukraine	105	0 (0)	105 (100)	92 (87.62)	13 (12.38)
United Kingdom	9050	253 (2.80)	8797 (97.20)	6825 (77.58)	1972 (22.42)
Total	31948	576 (1.80)	31372 (98.20)	26943 (85.88)	4429 (14.12)

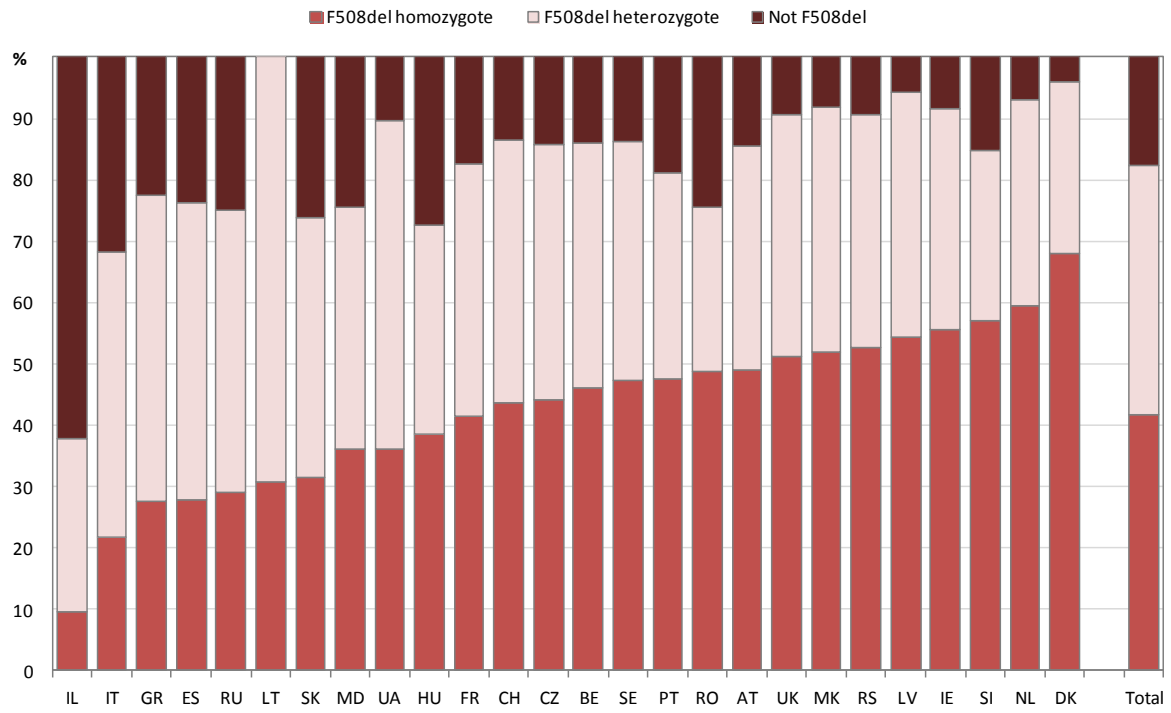
The table shows how many patients underwent DNA analysis to identify the CFTR mutations (column “genotyping done”) and, for those patients, how many patients had both mutations identified (column “two mutations identified”) and for how many one or both mutations remained unidentified (column “at least one mutation unknown”).

Figure 3.1 Proportion of identified mutations, by country and overall. Only patients with DNA analysis.



This graph shows the percentage of mutations that are not identified (unknown in light pink) after DNA analysis, by country and overall. One "allele" means one of the two CFTR genes. The number of non-identified alleles varies greatly from country to country; this is partly due to the different approaches to DNA testing. Overall, almost 10% of mutations remain unidentified after DNA analysis, leaving 14.12% of the patients with at least one mutation unidentified.

Figure 3.2 Prevalence of F508del homozygous and heterozygous patients, by country and overall. All patients seen in 2013.



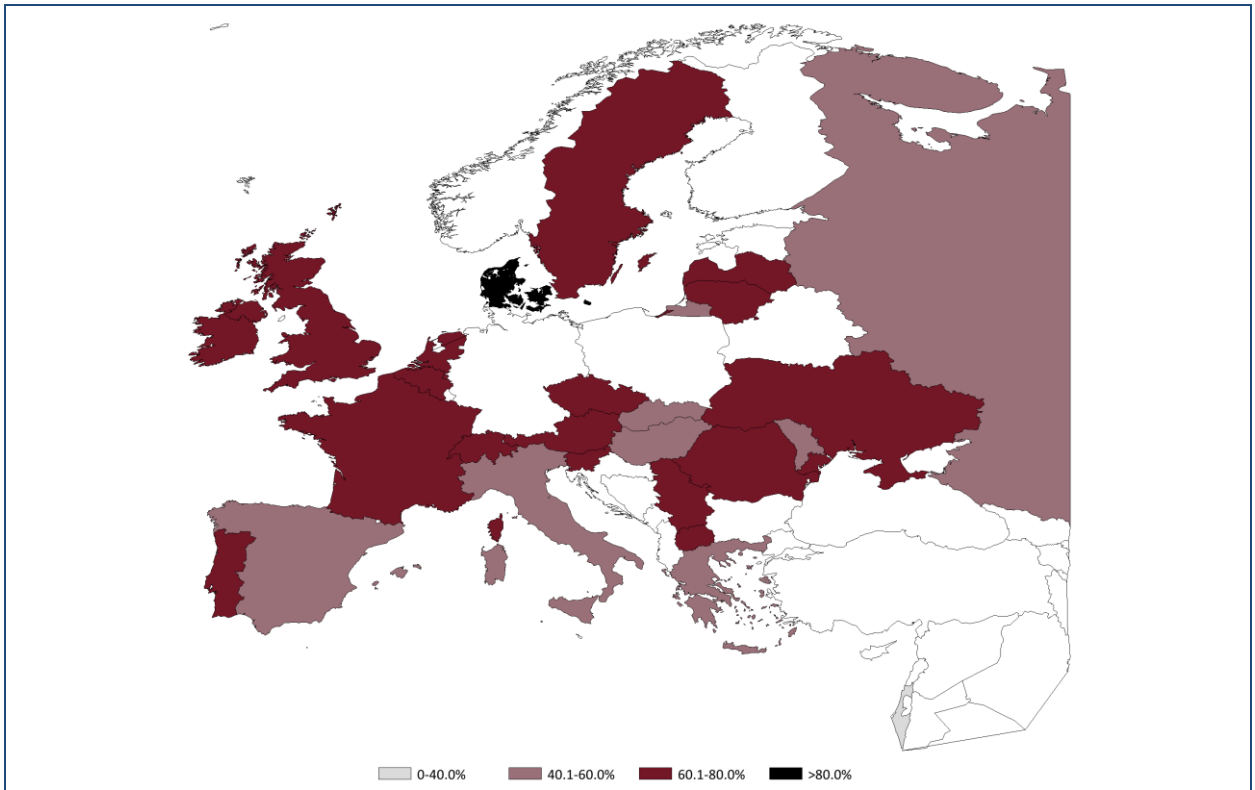
F508del is the name of the most commonly occurring CFTR mutation in the world. Patients who carry two F508del mutations are often described as having "classic CF", but other combinations of mutations may cause the same degree of disease. We have grouped the patients in F508del homozygous (have two F508del mutations), F508del heterozygous (have one F508del mutation and another mutation, different from F508del), and patients without F508del mutations. Only patients for whom the genotype is known, have been included in this graph. "Unknown" mutations have been classified as "other", since F508del is included in all genotyping kits and would have been identified. Please note that the genotype grouping in this graph does not reflect the severity of the disease in the countries.

Table 3.2 Allelic frequencies of the 15 most common mutations in the ECFSPR database.

Mutation name	Number of alleles	Percentage among tested	Country with highest allele frequency
F508del	38921	62.03	Denmark (81.97%)
G542X	1721	2.74	Greece (7.65%)
N1303K	1315	2.10	Italy (5.64%)
G551D	879	1.40	Ireland (8.47%)
W1282X	718	1.14	Israel (23.11%)
R117H	689	1.10	Ireland (2.45%)
2789+5G->A	591	0.94	Greece (3.06%)
1717-1G->A	576	0.92	Switzerland (2.45%)
3849+10KbC->T	493	0.79	Latvia (15.38%)
R553X	453	0.72	Lithuania (11.54%)
621+1G->T	364	0.58	Greece (7.14%)
R1162X	362	0.58	Slovenia (5.06%)
2183AA->G	354	0.56	Italy (2.05%)
CFTRdele2,3	341	0.54	Czech Republic (6.13%)
D1152H	318	0.51	Israel (5.78%)

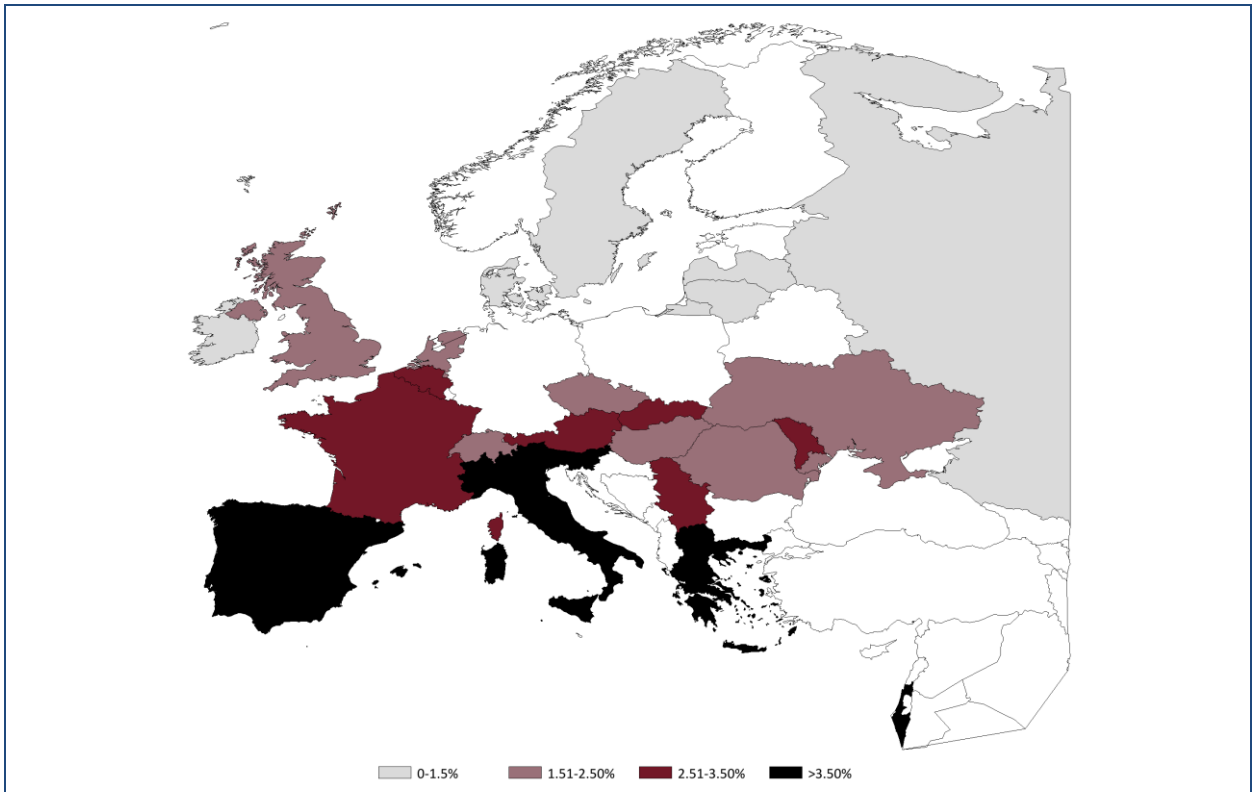
This table presents the allele frequency of the 15 most commonly occurring mutations found in the ECFSPR database. The last column reports in which country this particular mutation is most frequent. F508del is by far the most frequent mutation. Additionally, since F508del is included in all genetic screening tests, this is also the mutation with the highest detection rate.

Figure 3.3 Geographical distribution of mutation F508del.



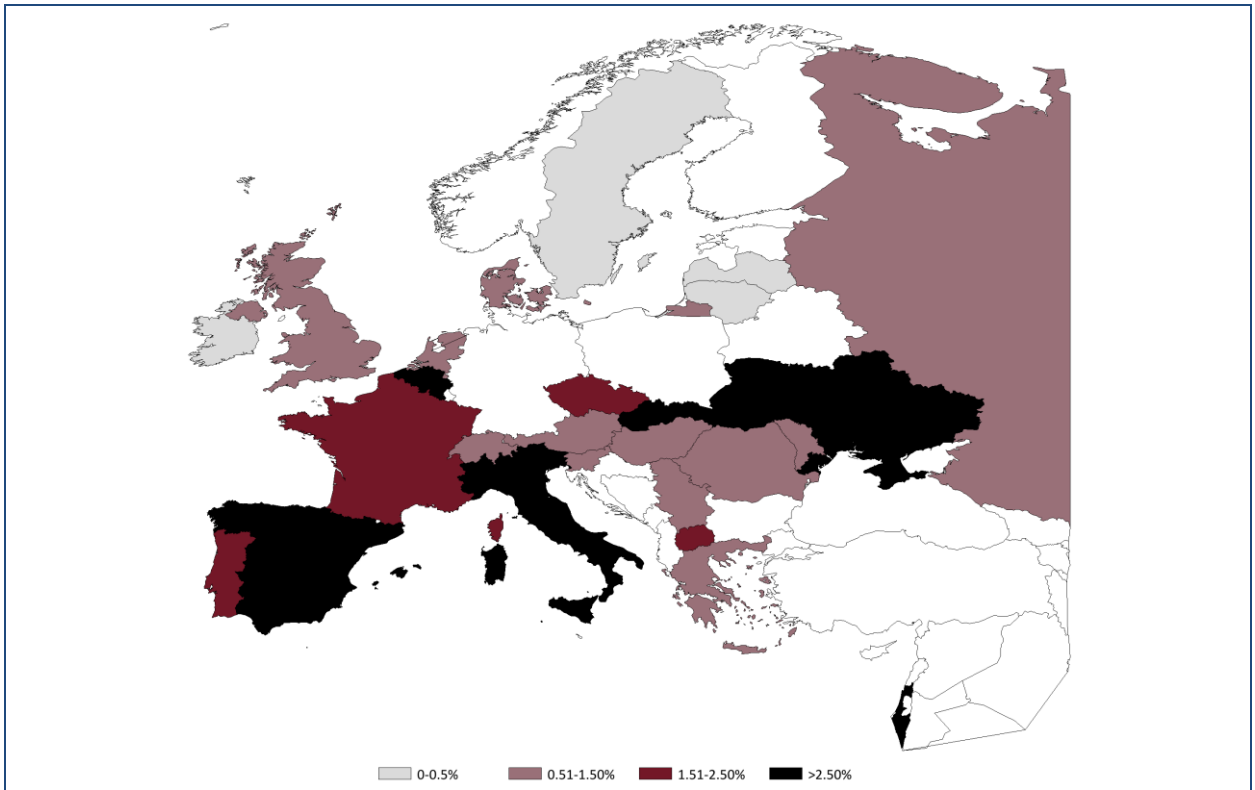
Although this mutation is the most common in all countries, the allele frequency still varies from 23.77% in Israel to 81.97% in Denmark.

Figure 3.4 Geographical distribution of mutation G542X.



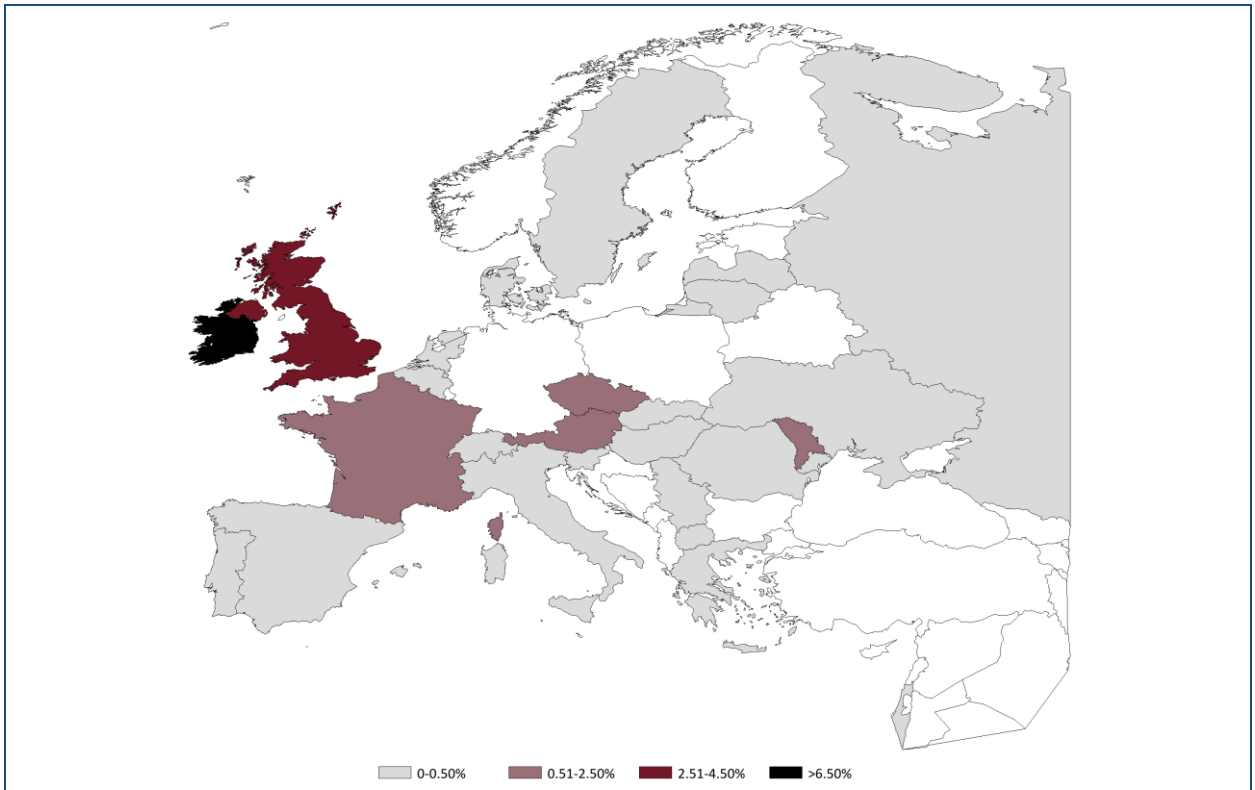
This mutation is most frequent in southern Europe, with the highest allele frequency in Greece (7.65%), whereas it is very rarely found in Scandinavia (0.86% in Denmark and 0.57% in Sweden, 0.0% in Latvia and Lithuania).

Figure 3.5 Geographical distribution of mutation N1303K.



This mutation is most frequent in Italy (5.64%) and other countries in Southern Europe and in Eastern Europe, but rare in Northern Europe.

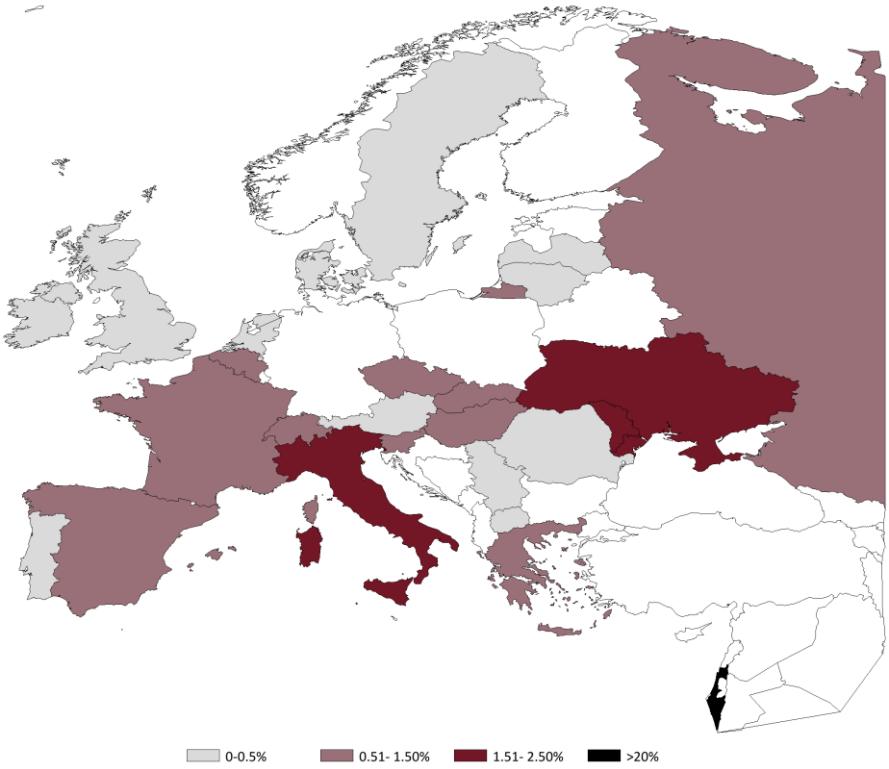
Figure 3.6 Geographical distribution of mutation G551D.



Note: Israel: G551D was not in the mutation panel for 2013, therefore the prevalence is unknown.

This mutation is most frequent in Ireland (8.47%), whereas it is very rare in Scandinavia and in Southern Europe (less than 0.5%).

Figure 3.7 Geographical distribution of mutation W1282X.



This mutation, of Middle-Eastern origin, is by far most frequent in Israel (23.11%) with a very high allele frequency in Ashkenazi Jews.

4. Lung function

FEV_1 is measured in litres but it is normally expressed as a percentage of the expected value (FEV_1%). The expected value is computed from healthy individuals of the same sex, height and age and is termed the reference population. For this report we used the reference populations and the equations described by Wang et al. for children and Hankinson et al. for adults (see Appendix 1, page 119, for full reference). An FEV_1% of 100 means that the lung function measure is equal to the mean lung function measure of people of the same age, sex and height of the healthy reference population.

Spirometry, the test that measures FEV_1, requires a certain amount of coordination, and can generally not be performed until a person with CF is about six years of age. We have therefore computed FEV_1% values only for patients aged 6 years or older.

We asked the countries to report to the ECFSPR the best FEV_1 recorded throughout the year (according to the FEV_1% computed at the CF centres). A few national registries do not record the best value, but other FEV_1 values, that may not be the patient's best that year, so we have added a footnote to the tables and graphs describing which FEV_1 was reported from those countries. Research has shown that when comparing groups of patients, the difference between the best FEV_1% and a random value from the same year can be up to 4.3% points[1]. This finding should be taken into consideration when comparing the results. Likewise, as lung function in CF deteriorates with age, differences in FEV_1 may reflect that the CF population of a country is older.

We excluded patients who have had one or more lung transplants from the analyses on FEV_1, since their lung function does not reflect the severity of their CF lung disease.

[1] Wanyama et al, JCF 2013; 9, S1:428

Table 4.1 FEV_1% of predicted: descriptive statistics, by country. Patients aged 6-17 years who have never had a lung transplant.

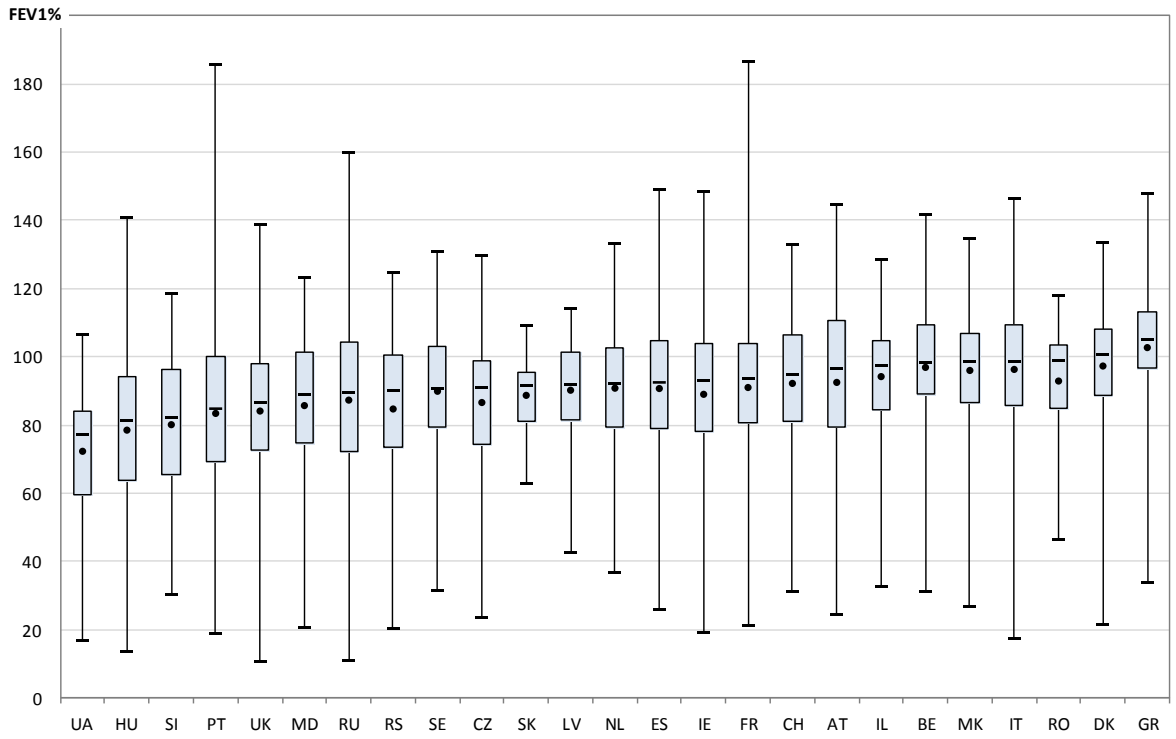
Country	N	N Miss	Mean (average FEV_1%)	Min	25th pctl (25% of patients have FEV_1% below this value)	Median (50% of patients have FEV_1% below this value)	75th pctl (75% of patients have FEV_1% below this value)	Max
Austria	229	5	92.5	24.5	79.3	96.6	110.5	144.6
Belgium	374	2	96.9	31.3	89.0	98.3	109.4	141.6
Czech Republic	182	37	86.6	23.5	74.4	90.9	98.9	129.6
Denmark	138	5	97.3	21.4	88.6	100.6	108.3	133.5
France	2027	112	91.0	21.1	80.5	93.7	104.1	186.6
Greece	47	0	102.7	33.9	96.8	105.0	113.3	147.8
Hungary	172	14	78.5	13.7	63.6	81.2	94.1	140.9
Ireland	368	18	89.0	19.3	78.2	93.0	103.8	148.5
Israel	181	2	94.2	32.7	84.3	97.4	104.9	128.5
Italy	863	197	96.3	17.3	85.8	98.7	109.2	146.5
Latvia	13	0	90.2	42.5	81.7	92.0	101.4	114.1
Rep of Macedonia	52	1	96	26.9	86.5	98.6	107	134.7
Rep of Moldova	20	2	85.7	20.6	74.8	88.9	101.2	123.3
The Netherlands	415	13	90.8	36.7	79.5	92.1	102.6	133.1
Portugal	94	8	83.4	19.0	69.4	84.8	100.2	185.7
Romania	23	0	92.9	46.5	84.8	99.0	103.6	118.0
Russian Federation	453	226	87.3	11.0	72.2	89.6	104.4	159.9
Serbia	68	2	84.7	20.2	73.5	90.2	100.5	124.7
Slovak Republic	21	0	88.7	62.8	80.9	91.7	95.5	109.2
Slovenia	36	1	80.1	30.4	65.3	82.2	96.5	118.6
Spain	509	19	90.7	25.9	79.2	92.5	104.7	149.0
Sweden[1]	159	7	89.9	31.4	79.5	90.7	102.9	131.0
Switzerland	221	4	92.2	31.3	81.0	94.9	106.5	133.0
Ukraine	61	0	72.3	16.9	59.7	77.3	84.1	106.4
United Kingdom[2]	2678	144	84.1	10.7	72.7	86.7	97.8	138.9

[1] Sweden reports FEV_1 collected at the time of the annual review.

[2] United Kingdom reports FEV_1 collected at the time of the annual review. All analyses of FEV_1 in the UK 2013 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

This table shows some descriptive statistics for FEV_1 in children, expressed as % of predicted. Note that transplanted patients and children below 6 years of age have been excluded from the analyses.

Figure 4.1 FEV_1% of predicted: box-plot, by country and overall. Patients aged 6-17 years who have never had a lung transplant.



Note: Sweden reports FEV_1 collected at the time of the annual review.
United Kingdom reports FEV_1 collected at the time of the annual review. All analyses of FEV_1 in the UK 2013 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

This box-plot is a graphic representation of the FEV_1 in children, expressed as % of predicted, detailed in table 4.1. For each country the dash (black line crossing the blue box) is the median, the black dot is the mean and the whiskers (vertical lines with a T-shaped end) are the minimum and the maximum.

Table 4.2 FEV_1% of predicted: descriptive statistics, by country. Patients aged 18 years or older who have never had a lung transplant.

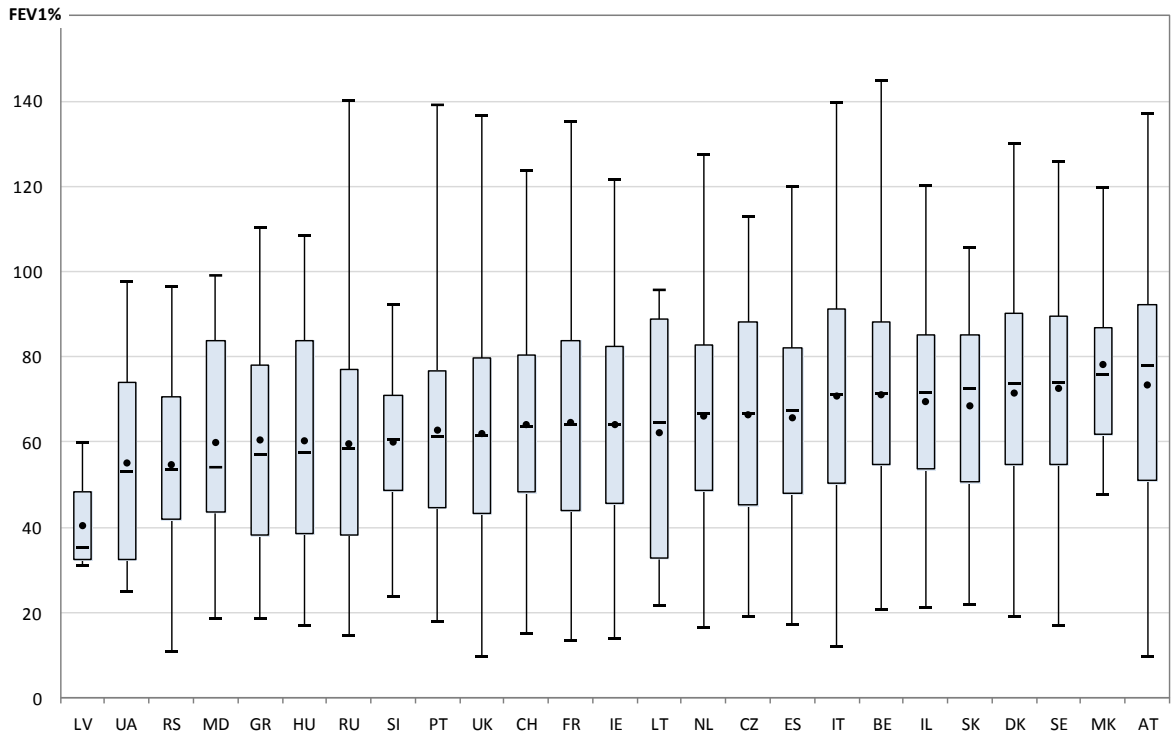
Country	N	N Miss	Mean (average FEV_1%)	Min	25th pctl (25% of patients have FEV_1% below this value)	Median (50% of patients have FEV_1% below this value)	75th pctl (75% of patients have FEV_1% below this value)	Max
Austria	179	0	73.4	9.7	51.2	77.9	92.3	137.1
Belgium	494	6	71.1	20.7	54.7	71.4	88.2	144.9
Czech Republic	116	78	66.4	19.1	45.3	66.8	88.3	113.0
Denmark	218	1	71.5	19.0	54.7	73.8	90.3	130.0
France	2413	48	64.6	13.4	44.0	64.2	83.9	135.2
Greece	28	0	60.5	18.6	38.2	57.1	78.1	110.3
Hungary	133	4	60.3	17.0	38.6	57.6	83.7	108.5
Ireland	385	20	64.1	14.0	45.8	64.2	82.3	121.6
Israel	257	4	69.5	21.1	53.9	71.7	85.2	120.3
Italy	1566	239	70.8	12.0	50.4	71.1	91.1	139.6
Latvia	4	0	40.4	31.1	32.6	35.2	48.2	60.0
Lithuania	12	1	62.2	21.6	32.9	64.7	88.7	95.7
Rep of Macedonia	21	0	78.2	47.6	61.7	75.8	86.9	119.6
Rep of Moldova	13	0	59.9	18.5	43.6	54.1	83.7	99.1
The Netherlands	605	16	66.1	16.4	48.6	66.6	82.8	127.5
Portugal	96	1	62.8	17.8	44.5	61.4	76.8	139.1
Russian Federation	354	107	59.6	14.7	38.3	58.6	77.1	140.1
Serbia	41	0	54.7	10.9	42.0	53.5	70.7	96.6
Slovak Republic	76	0	68.5	22.0	50.8	72.6	85.2	105.6
Slovenia	20	0	60.0	23.8	48.7	60.7	70.8	92.3
Spain	426	13	65.7	17.2	48	67.3	82	120.0
Sweden[1]	292	18	72.6	17.0	54.7	74.0	89.5	125.8
Switzerland	267	4	64.1	15.2	48.4	63.7	80.5	123.8
Ukraine	11	0	55.1	24.9	32.6	53.1	73.9	97.7
United Kingdom[2]	4237	150	62.0	9.7	43.2	61.6	79.8	136.5

[1] Sweden reports FEV_1 collected at the time of the annual review.

[2] United Kingdom reports FEV_1 collected at the time of the annual review. All analyses of FEV_1 in the UK 2013 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

This table shows some descriptive statistics for FEV_1 in adults, expressed as % of predicted. Note that transplanted patients have been excluded from the analyses.

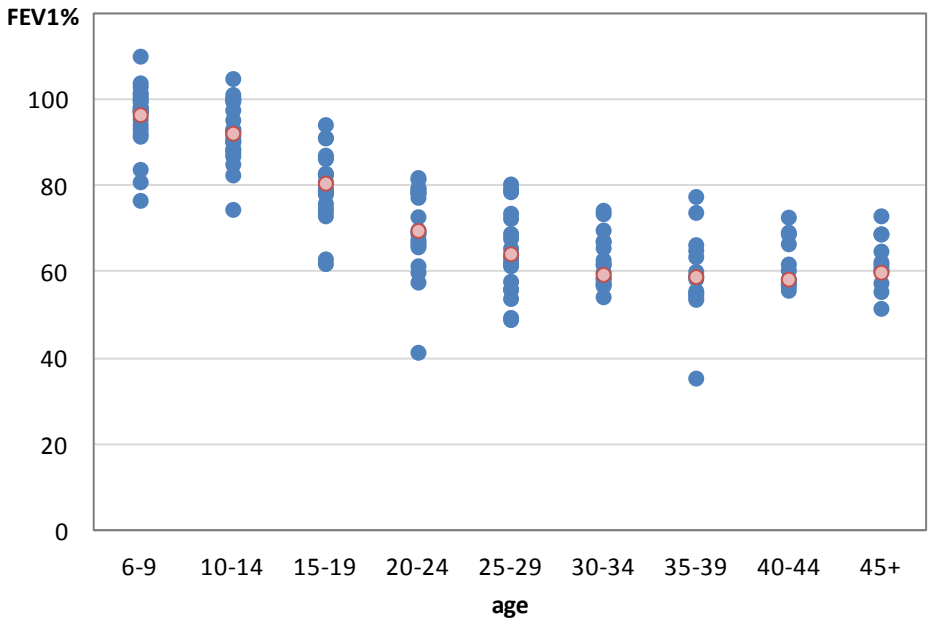
Figure 4.2 FEV_1% of predicted: box-plot, by country and overall. Patients aged 18 years or older who have never had a lung transplant.



Note: Sweden reports FEV_1 collected at the time of the annual review.
United Kingdom reports FEV_1 collected at the time of the annual review. All analyses of FEV_1 in the UK 2013 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

This box-plot is a graphic representation of the FEV_1 in adults, expressed as % of predicted detailed in table 4.2. For each country the dash (black line crossing the blue box) is the median, the black dot is the mean and the whiskers (vertical lines with a T-shaped end) are the minimum and the maximum.

Figure 4.3 Median FEV_1% of predicted by age group and by country. Patients aged 6 years or older who have never had a lung transplant.



Note: we excluded from the analyses those age groups wherein the number of patients was <10.
Note: not all the countries reported the best FEV_1 value of the year (see tables 4.1 and 4.2).

This graph shows the median FEV_1% (the value that separates the highest and lowest half of the patients) by age group. Each country is represented by a dot (in blue) and the overall estimate is in red. The general pattern shows that the FEV_1% slowly decreases until the age of 30-34, and then levels out. The patients in the oldest age groups are patients that survived, and may therefore represent the patients with less disease severity. There is considerable variability between countries.

Table 4.3 FEV_1% of predicted: descriptive statistics by age group (patients aged 6 years or older) who have never had a lung transplant.

Age at FEV_1 measurement	N	N Miss	Mean	Min	25th pctl	Median	75th pctl	Max
6-9	3112	384	94.8	11	84.7	96.6	105.9	186.6
10-14	3970	282	89.9	16.3	78.4	92.3	103.5	185.7
15-19	3774	238	77.5	10.7	62.6	80.7	93.6	148.5
20-24	3330	226	68.2	14	49.2	69.7	86.9	137.1
25-29	2510	152	64.3	9.7	45.1	64.3	82.1	135.2
30-34	1810	83	61.2	9.7	42.1	59.5	78.6	144.9
35-39	1184	56	61.2	12.3	42.4	59	78	129.3
40-44	817	41	60.3	11.5	40.5	58.4	77	135.9
45+	1161	67	62.4	13.4	42.8	60	81.3	139.6

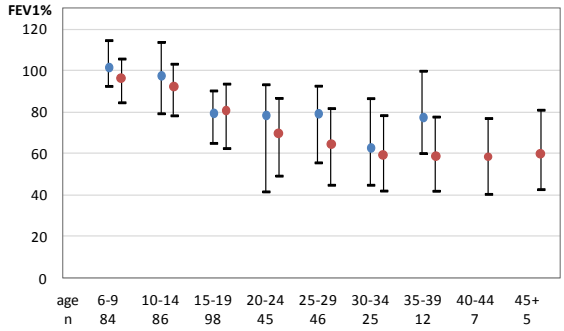
Note: not every country reported the best FEV_1 value of the year (see tables 4.1 and 4.2).

This table shows FEV_1% by age group for the total data set. The median values reported in this table are shown as red dots in fig 4.3.

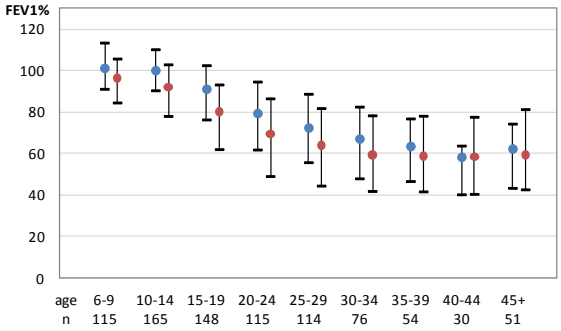
Figure 4.4 Quartiles of FEV_1% of predicted by age group and by country. Patients aged 6 years or older and who have never had a lung transplant.

The figures below show the FEV_1% in different age groups, separately for each country. The dot shows the median, and the whiskers show the 25th and 75th percentiles (the median, the 25th percentile and the 75th percentile are collectively named "quartiles"). In blue are the quartiles for the country, in red are the pooled quartiles computed on all other countries (i.e. excluding that country). We did not compute quartiles where the number of patients is <10 in an age group, so there are no blue dots for those age groups (the number of patients in each age group is shown below the horizontal axis). We therefore excluded Latvia, Lithuania, the Republic of Moldova and Romania from the graphs because none of the age groups had more than 10 patients.

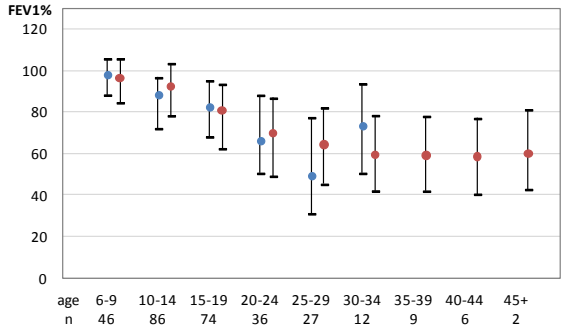
Quartiles of FEV_1%: Austria



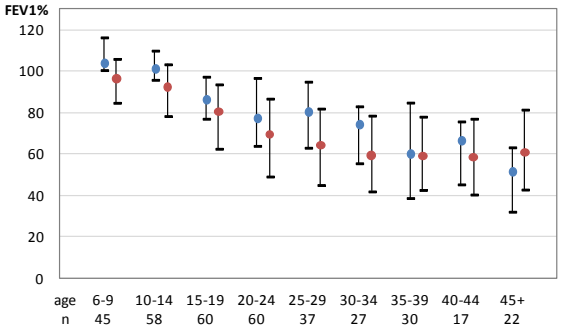
Quartiles of FEV_1%: Belgium



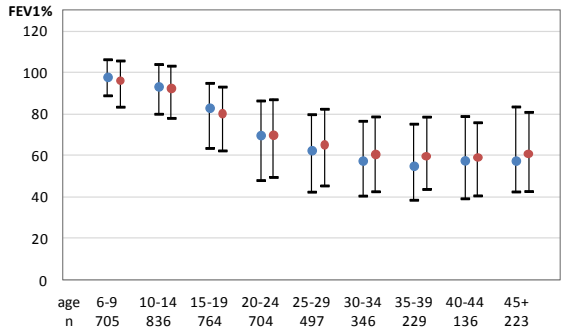
Quartiles of FEV_1%: Czech Republic



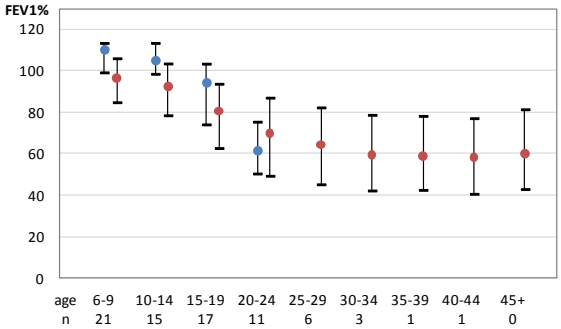
Quartiles of FEV_1%: Denmark



Quartiles of FEV_1%: France

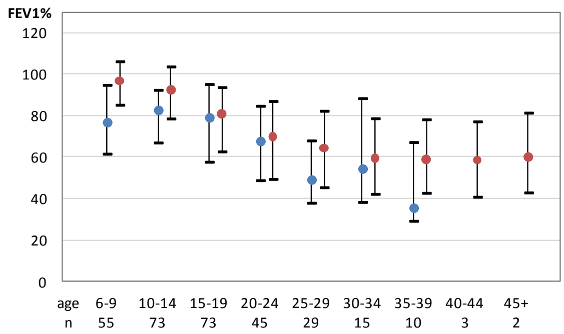


Quartiles of FEV_1%: Greece

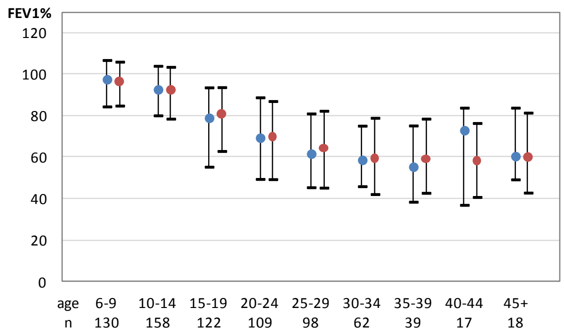


[figure 4.4 continued]

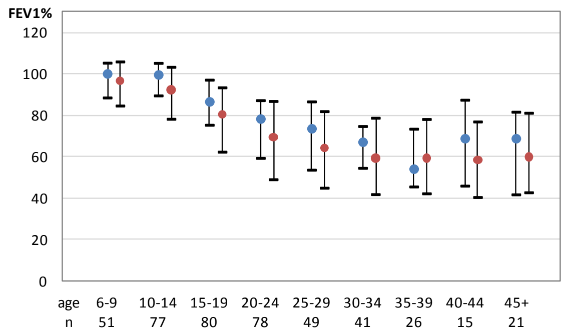
Quartiles of FEV₁%: Hungary



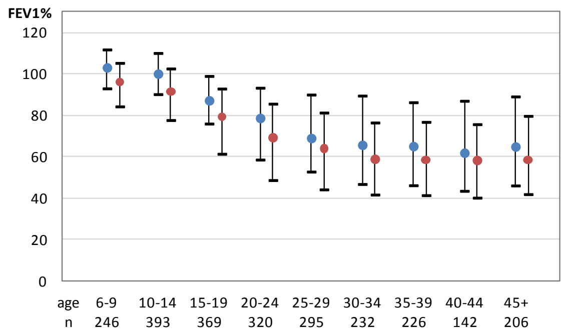
Quartiles of FEV₁%: Ireland



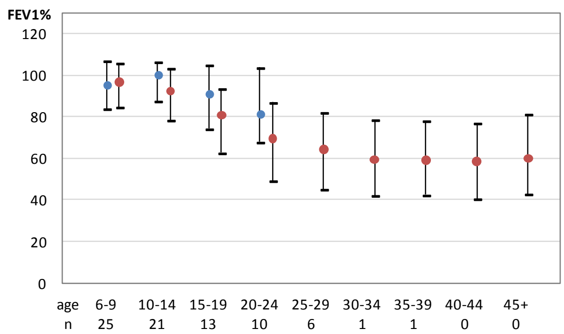
Quartiles of FEV₁%: Israel



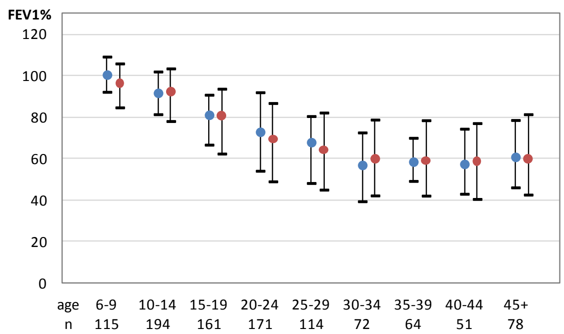
Quartiles of FEV₁%: Italy



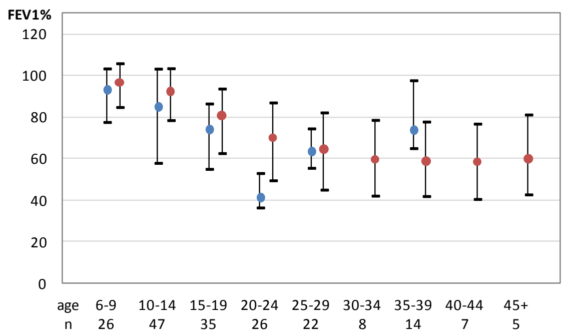
Quartiles of FEV₁%: Rep of Macedonia



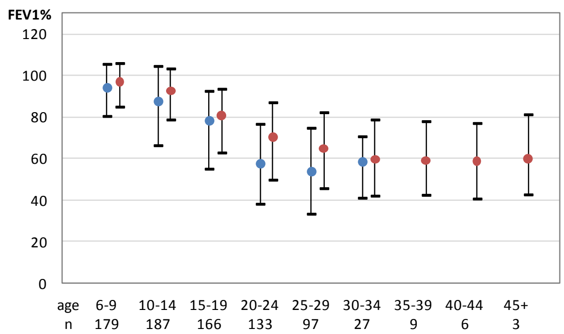
Quartiles of FEV₁%: The Netherlands



Quartiles of FEV₁%: Portugal

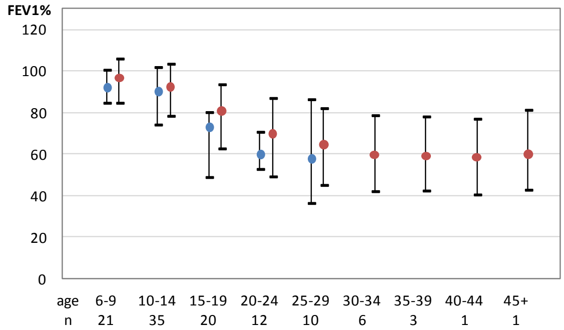


Quartiles of FEV₁%: Russian Federation

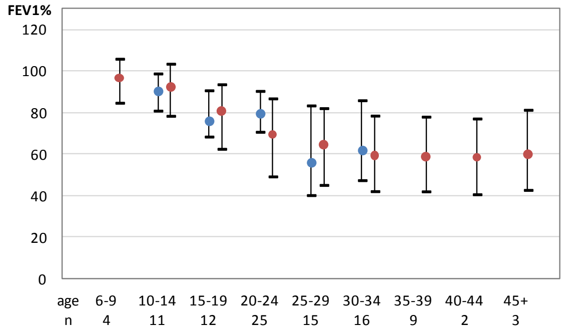


[figure 4.4 continued]

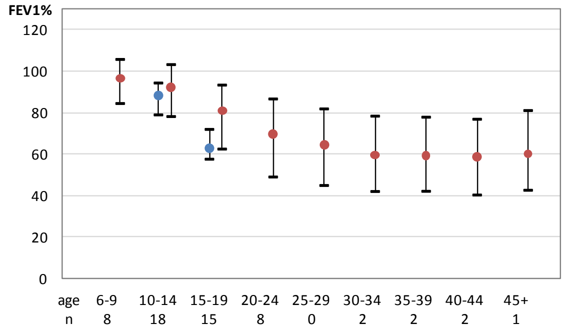
Quartiles of FEV_1%: Serbia



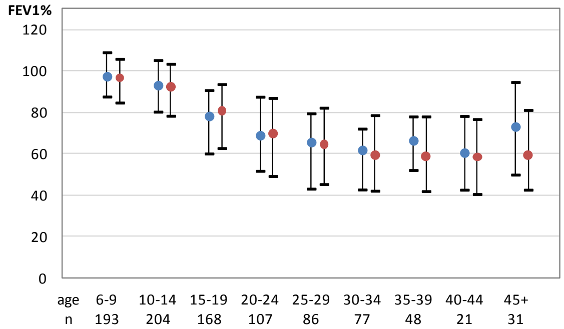
Quartiles of FEV_1%: Slovak Republic



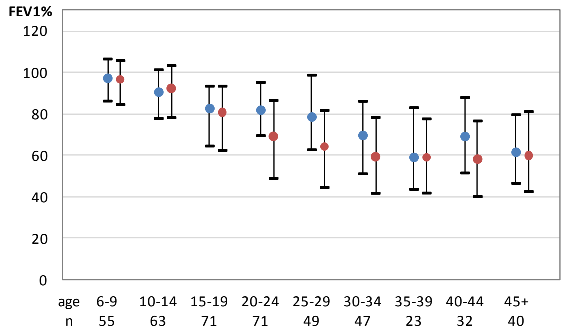
Quartiles of FEV_1%: Slovenia



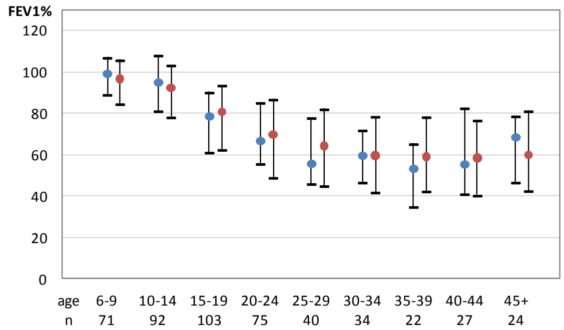
Quartiles of FEV_1%: Spain



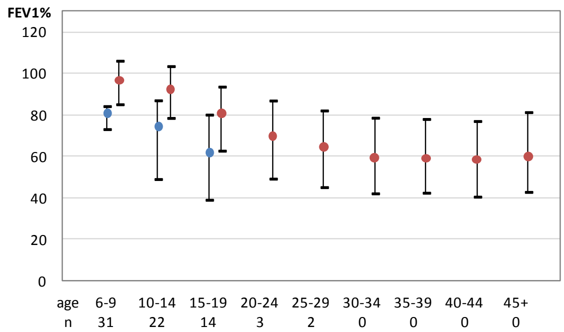
Quartiles of FEV_1%: Sweden[1]



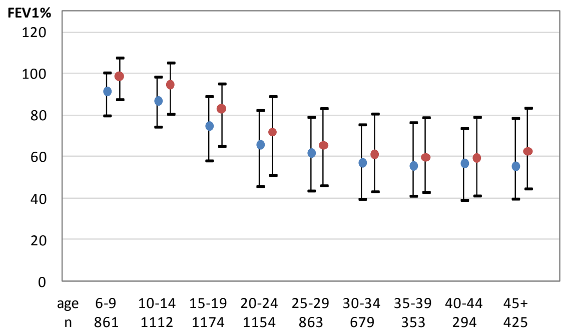
Quartiles of FEV_1%: Switzerland



Quartiles of FEV_1%: Ukraine



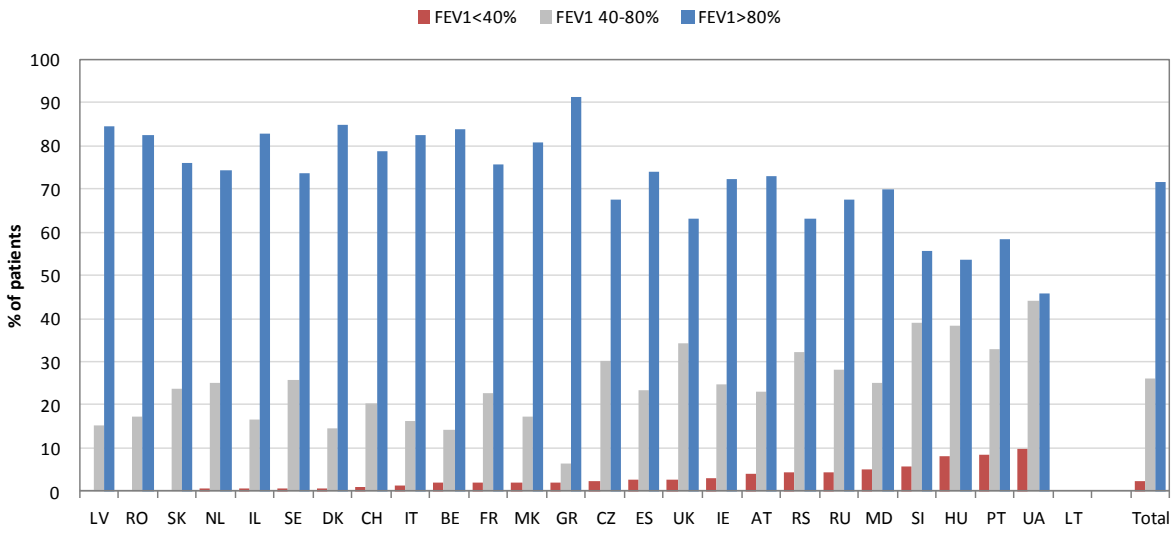
Quartiles of FEV_1%: United Kingdom[2]



[1] Sweden reports FEV_1 collected at the time of the annual review.

[2] United Kingdom reports FEV_1 collected at the time of the annual review. All analyses of FEV_1 in the UK 2013 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

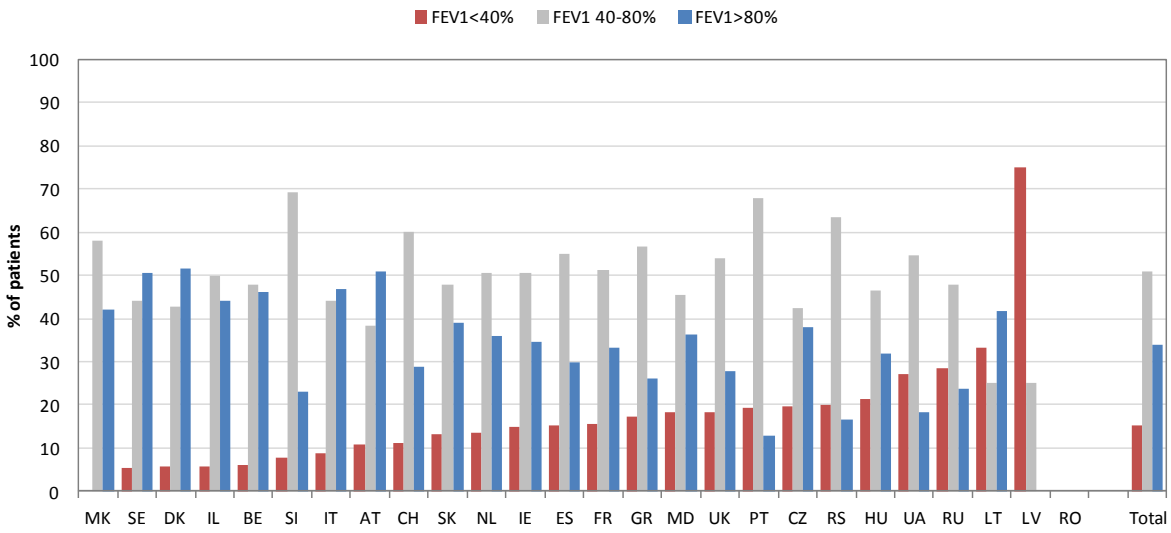
Figure 4.5 FEV_1% of predicted according to severity group and age group, by country and overall. Patients aged 6-17 years who have never had a lung transplant.



Note: Not every country reported the best FEV_1 value of the year.
Sweden reports FEV_1 collected at the time of the annual review.
United Kingdom reports FEV_1 collected at the time of the annual review. All analyses of FEV_1 in the UK 2013 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

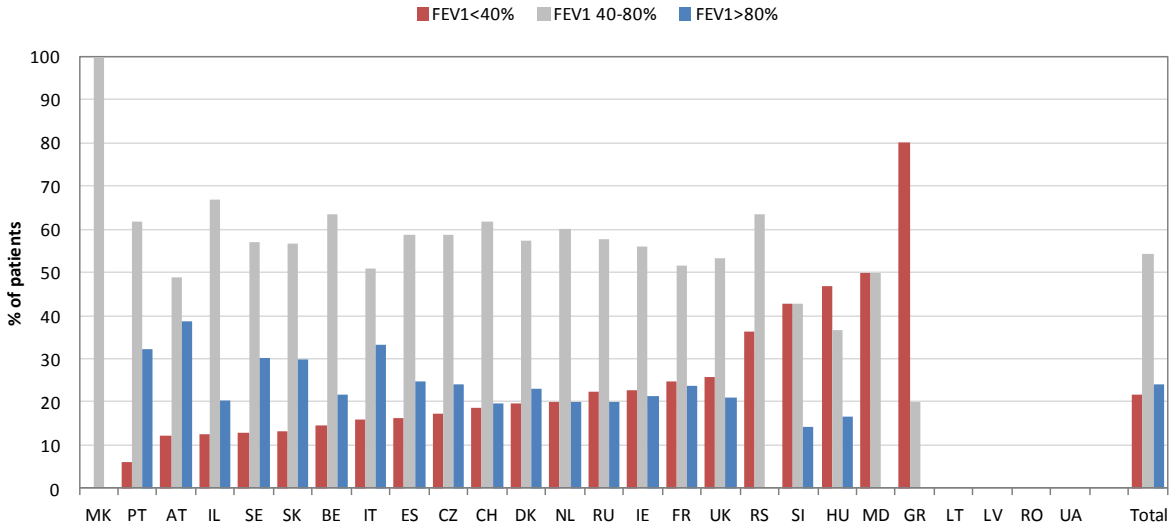
Figures 4.5, 4.6 and 4.7 show the FEV_1% by severity group, by country and overall. Patients with an FEV_1% higher than 80% are generally considered to have mild lung disease, patients with FEV_1% between 80% and 40% moderate lung disease, and patients with FEV_1 <40% severe lung disease. However, since a 10 year old child with a lung function of 50% has considerably worse lung disease than a 50 year old patient with the same FEV_1%, and the age distribution is not the same in all countries, we have chosen to present children (fig 4.5) and adults (fig 4.6 and 4.7) separately.

Figure 4.6 FEV_1% of predicted according to severity group and age group, by country and overall. Patients aged 18-29 years who have never had a lung transplant.



Note: Not every country reported the best FEV_1 value of the year.
Sweden reports FEV_1 collected at the time of the annual review;
United Kingdom reports FEV_1 collected at the time of the annual review. All analyses of FEV_1 in the UK 2013 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

Figure 4.7 FEV_1% of predicted according to severity group and age group, by country and overall. Patients aged 30 years or older who have never had a lung transplant.



Note: Not every country reported the best FEV_1 value of the year.
Sweden reports FEV_1 collected at the time of the annual review;
United Kingdom reports FEV_1 collected at the time of the annual review. All analyses of FEV_1 in the UK 2013 annual report are restricted to those patients for whom prior annual surveys showed no prior lung transplants.

5. Microbiology

We collect data on three chronic infections – *Pseudomonas aeruginosa*, *Burkholderia cepacia complex species* and *Staphyloccocus aureus* – as well as the occurrence of non-tuberculous mycobacteria (NTM) and *Stenotrophomonas maltophilia*. In the microbiology category discrepancies exist between the ECFSPR definitions and those of the national registries. The ECFSPR definition of chronic infection (see Appendix 2) is:

> Patient should be defined as chronically infected if he/she fulfils the criteria now or has done in recent years and the physician has no reason to think the status has changed
>
> a. modified Leeds criteria, chronic infection: >50% of the sputum samples positive, collected during the last 12 months. At least 4 sputum samples during that period;
> b. and/or significantly raised bacteria-specific antibodies according to local laboratories.

When minor differences exist, the alternative definition is in a footnote; when differences are major – or if the variable is not collected at all – the variable has been set to missing for that country.

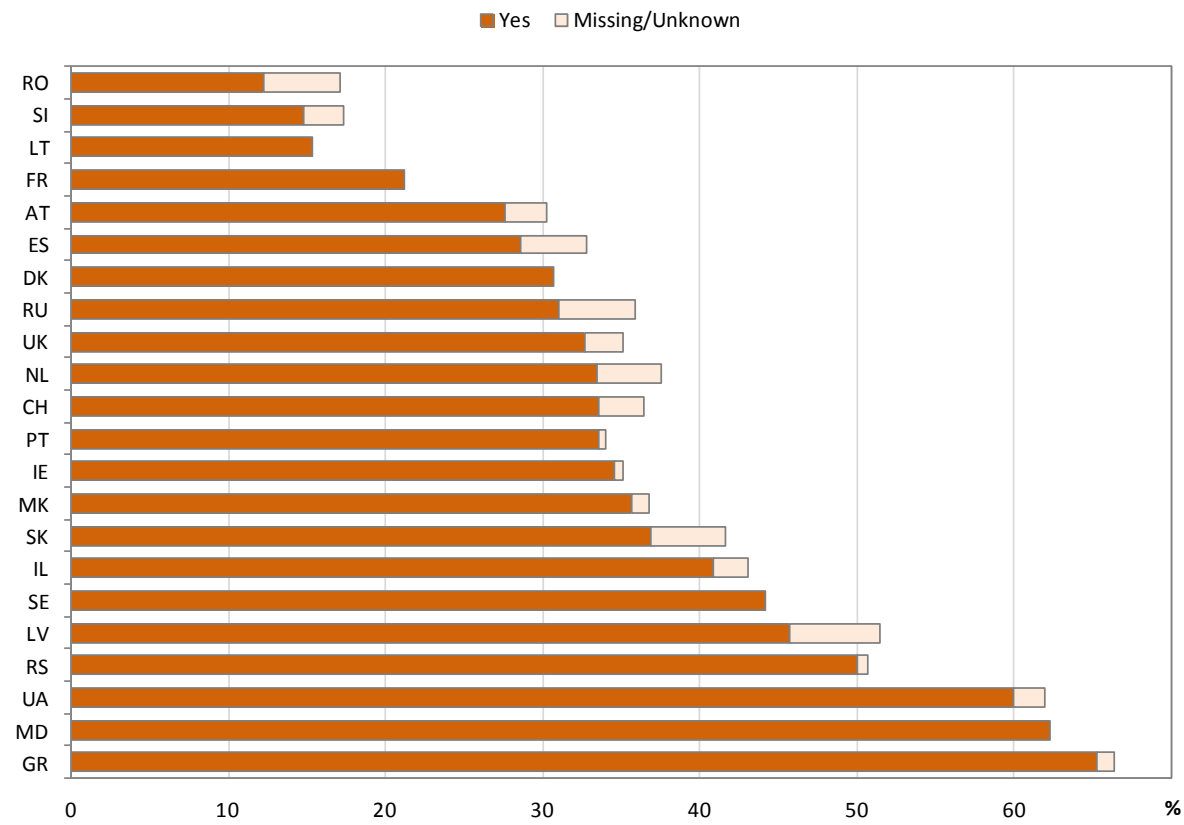
Table 5.1 Prevalence of chronic bacterial infection in all patients seen in 2013, by country.

Country	Chronic *Pseudomonas aeruginosa* number (%)			Chronic *Burkholderia cepacia complex species* number (%)			Chronic *Staphylococcus aureus* number (%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Austria	14 (2.63)	371 (69.74)	147 (27.63)	10 (1.88)	508 (95.49)	14 (2.63)	18 (3.38)	242 (45.49)	272 (51.13)
Belgium[1]	151 (13.10)	690 (59.84)	312 (27.06)	156 (13.53)	964 (83.61)	33 (2.86)	1153 (100)	-	-
Czech Republic	220 (37.41)	248 (42.18)	120 (20.41)	246 (41.84)	291 (49.49)	51 (8.67)	220 (37.41)	169 (28.74)	199 (33.84)
Denmark	0 (0)	323 (69.31)	143 (30.69)	0 (0)	438 (93.99	28 (6.01)	466 (100)	-	-
France	0 (0)	4956 (78.84)	1330 (21.16)	0 (0)	6219 (98.93)	67 (1.07)	6286 (100)	-	-
Greece	1 (1.02)	33 (33.67)	64 (65.31)	1 (1.02)	97 (98.98)	0 (0)	1 (1.02)	57 (58.16)	40 (40.82)
Hungary	81 (16.01)	261 (51.58)	164 (32.41)	81 (16.01)	416 (82.21)	9 (1.78)	83 (16.40)	257 (50.79)	166 (32.81)
Ireland	6 (0.56)	690 (64.91)	367 (34.52)	6 (0.56)	1033 (97.18)	24 (2.26)	6 (0.56)	596 (56.07)	461 (43.37)
Israel	12 (2.27)	301 (56.90)	216 (40.83)	13 (2.46)	513 (96.98)	3 (0.57)	12 (2.27)	342 (64.65)	175 (33.08)
Italy	745 (15.62)	2574 (53.95)	1452 (30.43)	743 (15.57)	3906 (81.87)	122 (2.56)	744 (15.59)	1955 (40.98)	2072 (43.43)
Latvia	2 (5.71)	17 (48.57)	16 (45.71)	2 (5.71)	30 (85.71)	3 (8.57)	1 (2.86)	10 (28.57)	24 (68.57)
Lithuania	0 (0)	11 (84.62)	2 (15.38)	0 (0)	10 (76.92)	3 (23.08)	0 (0)	4 (30.77)	9 (69.23)
Rep of Macedonia	1 (1.02)	62 (63.27)	35 (35.71)	1 (1.02)	95 (96.94)	2 (2.04)	1 (1.02)	63 (64.29)	34 (34.69)
Rep of Moldova	0 (0)	23 (37.70)	38 (62.30)	57 (93.44)	4 (6.56)	0 (0)	0 (0)	32 (52.46)	29 (47.54)
The Netherlands	54 (4.03)	838 (62.49)	449 (33.48)	51 (3.80)	1265 (94.33)	25 (1.86)	52 (3.88)	772 (57.57)	517 (38.55)
Portugal	1 (0.39)	169 (66.02)	86 (33.59)	1 (0.39)	238 (92.97)	17 (6.64)	1 (0.39)	141 (55.08)	114 (44.53)
Romania	2 (4.88)	34 (82.93)	5 (12.20)	0 (0)	41 (100)	0 (0)	0 (0)	37 (90.24)	4 (9.76)
Russian Federation	93 (4.84)	1232 (64.10)	597 (31.06)	88 (4.58)	1684 (87.62)	150 (7.80)	104 (5.41)	863 (44.90)	955 (49.69)
Serbia	1 (0.65)	76 (49.35)	77 (50.00)	1 (0.65)	130 (84.42)	23 (14.94)	3 (1.95)	64 (41.56)	87 (56.49)
Slovak Republic	7 (4.70)	87 (58.39)	55 (36.91)	6 (4.03)	133 (89.26)	10 (6.71)	6 (4.03)	88 (59.06)	55 (36.91)
Slovenia	2 (2.47)	67 (82.72)	12 (14.81)	2 (2.47)	76 (93.83)	3 (3.70)	2 (2.47)	46 (56.79)	33 (40.74)
Spain	57 (4.15)	924 (67.25)	393 (28.60)	63 (4.59)	1250 (90.98)	61 (4.44)	56 (4.08)	758 (55.17)	560 (40.76)
Sweden	0 (0)	343 (55.86)	271 (44.14)	0 (0)	595 (96.91)	19 (3.09)	614 (100)	-	-
Switzerland	19 (2.87)	421 (63.60)	222 (33.53)	19 (2.87)	626 (94.56)	17 (2.57)	20 (3.02)	294 (44.41)	348 (52.57)
Ukraine	2 (1.90)	40 (38.10)	63 (60.00)	2 (1.90)	102 (97.14)	1 (0.95)	2 (1.90)	17 (16.19)	86 (81.90)
United Kingdom[2]	216 (2.39)	5874 (64.91)	2960 (32.71)	0 (0)	8724 (96.40)	326 (3.60)	249 (2.75)	7290 (80.55)	1511 (16.70)

[1] Belgium: most of the patients that have missing values are transplanted patients.
[2] United Kingdom: chronicity for *Pseudomonas aeruginosa* and *Staphylococcus aureus* is defined as: 3 or more positive isolates during the last 12 months. Information on *Burkholderia* is collected as follows: *Burkholderia* grown at annual review, not necessarily chronic.

This table shows, separately by country, the frequency of chronic *Pseudomonas aeruginosa*, chronic *Burkholderia cepacia complex species* and chronic *Staphylococcus aureus*. The number of missing values is also included. The identification rate of *Burkholderia cepacia complex species* in particular may also be influenced by differences in culture techniques employed.

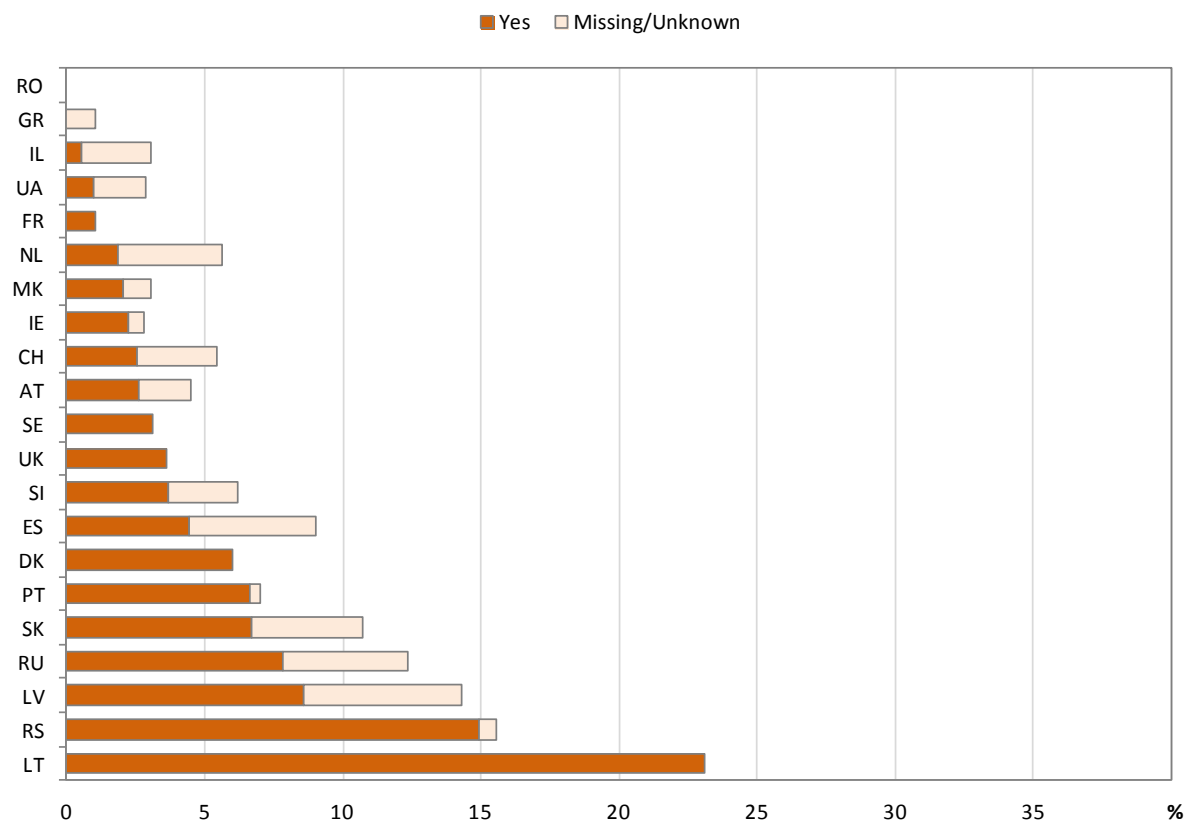
Figure 5.1 Prevalence of chronic Pseudomonas aeruginosa infection in all patients seen in 2013, by country.



Note: We excluded from the graph the countries for which the information on *Pseudomonas aeruginosa* was missing for more than 10% of the patients.
Note: Belgium: most of the patients that have missing values are transplanted patients.
United Kingdom: for chronic *Pseudomonas aeruginosa* the definition is: 3 or more positive isolates during the last 12 months.

The horizontal bars represent the percentage of patients with chronic *Pseudomonas aeruginosa* infection (in dark orange) and the percentage of patients where information on *Pseudomonas aeruginosa* infection was missing (in light orange). This is a frequent infection, but prevalence varies considerably between countries.

Figure 5.2 Prevalence of chronic Burkholderia cepacia complex species infection in all patients seen in 2013, by country.

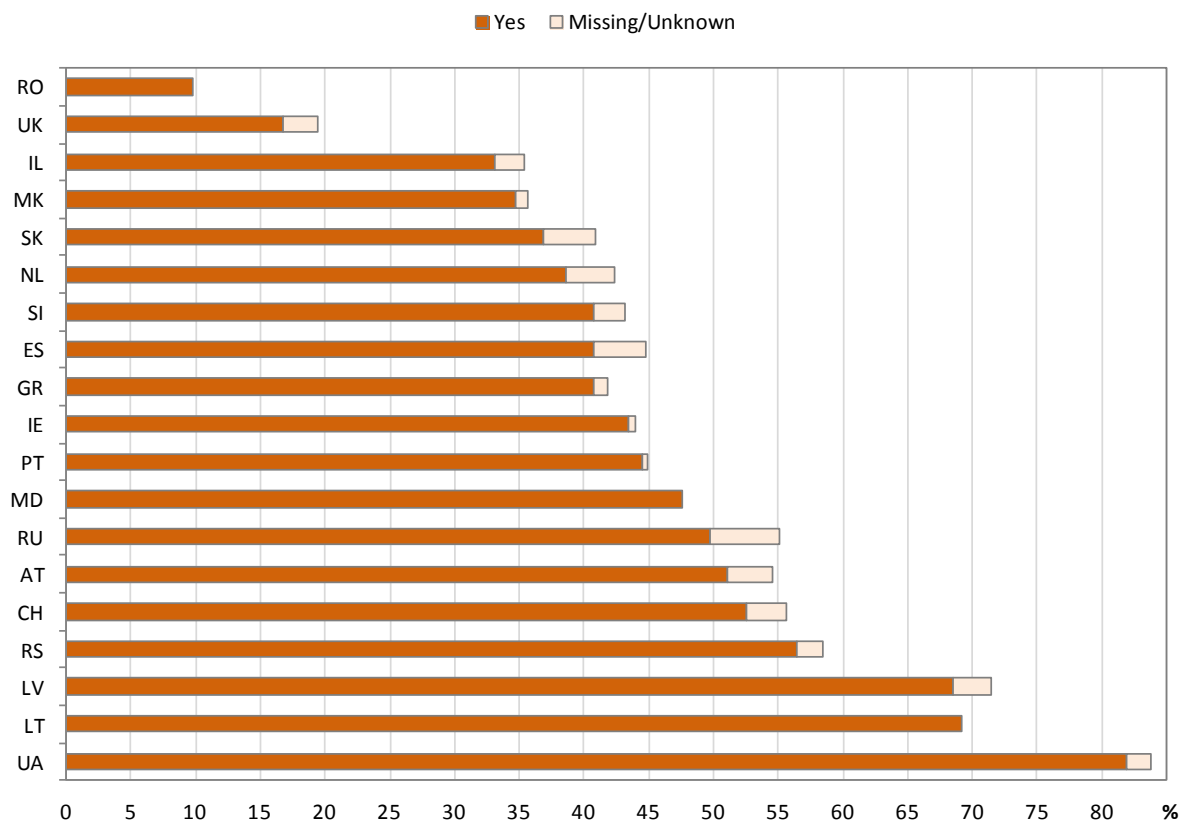


Note: We excluded from the graph the countries for which the information on *Burkholderia cepacia complex species* was missing for more than 10% of the patients.

Note: Belgium: most of the patients that have missing values are transplanted patients.
United Kingdom: information on *Burkholderia* is collected as follows: *Burkholderia* grown at annual review, not necessarily chronic.

The horizontal bars represent the percentage of patients with chronic *Burkholderia* infection (in dark orange) and the percentage of patients where information on *Burkholderia* infection was missing (in light orange). This infection is much less frequent than *Pseudomonas aeruginosa* (note the different scale on the horizontal axis), and there is also some variation.

Figure 5.3 Prevalence of chronic Staphylococcus aureus infection in all patients seen in 2013, by country.



Note: We excluded from the graph the countries for which the information on *Staphylococcus aureus* was missing for more than 10% of the patients.

Note: Belgium: most of the patients that have missing values are transplanted patients.
United Kingdom: for chronic *Staphylococcus aureus* the definition is: 3 or more positive isolates during the last 12 months.

The horizontal bars represent the percentage of patients with chronic *Staphylococcus aureus* infection (in dark orange) and the percentage of patients where information on *Staphylococcus aureus* was missing (in light orange). This infection is as frequent as chronic *Pseudomonas aeruginosa* infection and a similar degree of variation between the countries can be observed.

Table 5.2 Prevalence of chronic bacterial infection in children seen in 2013, by country.

Country	Chronic *Pseudomonas aeruginosa* number (%)			Chronic *Burkholderia cepacia complex species* number (%)			Chronic *Staphylococcus aureus* number (%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Austria	13 (3.96)	276 (84.15)	39 (11.89)	5 (1.52)	322 (98.17)	1 (0.30)	15 (4.57)	143 (43.60)	170 (51.83)
Belgium[1]	7 (1.39)	436 (86.51)	61 (12.10)	7 (1.39)	489 (97.02)	8 (1.59)	504 (100)	-	-
Czech Republic	127 (38.02)	167 (50.00)	40 (11.98)	135 (40.42)	196 (58.68)	3 (0.90)	122 (36.53)	94 (28.14)	118 (35.33)
Denmark	0 (0)	174 (93.05)	13 (6.95)	0 (0)	187 (100)	0 (0)	187 (100)	-	-
France	0 (0)	2839 (91.64)	259 (8.36)	0 (0)	3084 (99.55)	14 (0.45)	3098 (100)	-	-
Greece	0 (0)	25 (39.06)	39 (60.94)	0 (0)	64 (100)	0 (0)	0 (0)	32 (50.00)	32 (50.00)
Hungary	20 (7.52)	170 (63.91)	76 (28.57)	20 (7.52)	243 (91.35)	3 (1.13)	22 (8.27)	155 (58.27)	89 (33.46)
Ireland	0 (0)	465 (83.04)	95 (16.96)	0 (0)	551 (98.39)	9 (1.61)	0 (0)	260 (46.43)	300 (53.57)
Israel	3 (1.24)	188 (78.01)	50 (20.75)	3 (1.24)	237 (98.34)	1 (0.41)	3 (1.24)	143 (59.34)	95 (39.42)
Italy	436 (20.04)	1433 (65.85)	307 (14.11)	434 (19.94)	1734 (79.69)	8 (0.37)	435 (19.99)	768 (35.29)	973 (44.72)
Latvia	2 (7.69)	15 (57.69)	9 (34.62)	2 (7.69)	23 (88.46)	1 (3.85)	1 (3.85)	5 (19.23)	20 (76.92)
Lithuania	0 -	0 -	0 -	0 -	0 -	0 -	0 -	0 -	0 -
Rep of Macedonia	1 (1.32)	53 (69.74)	22 (28.95)	1 (1.32)	74 (97.37)	1 (1.32)	1 (1.32)	48 (63.16)	27 (35.53)
Rep of Moldova	0 (0)	17 (35.42)	31 (64.58)	47 (97.92)	1 (2.08)	0 (0)	0 (0)	26 (54.17)	22 (45.83)
The Netherlands	4 (0.66)	485 (79.77)	119 (19.57)	3 (0.49)	598 (98.36)	7 (1.15)	4 (0.66)	367 (60.36)	237 (38.98)
Portugal	0 (0)	96 (72.18)	37 (27.82)	0 (0)	123 (92.48)	10 (7.52)	0 (0)	76 (57.14)	57 (42.86)
Romania	2 (5.00)	33 (82.50)	5 (12.50)	0 (0)	40 (100)	0 (0)	0 (0)	36 (90.00)	4 (10.00)
Russian Federation	54 (3.95)	983 (71.86)	331 (24.20)	44 (3.22)	1260 (92.11)	64 (4.68)	57 (4.17)	609 (44.52)	702 (51.32)
Serbia	0 (0)	67 (60.91)	43 (39.09)	0 (0)	95 (86.36)	15 (13.64)	1 (0.91)	44 (40.00)	65 (59.09)
Slovak Republic	1 (1.59)	48 (76.19)	14 (22.22)	0 (0)	63 (100)	0 (0)	0 (0)	43 (68.25)	20 (31.75)
Slovenia	0 (0)	53 (89.83)	6 (10.17)	0 (0)	58 (98.31)	1 (1.69)	0 (0)	37 (62.71)	22 (37.29)

[1] Belgium: most of the patients that have missing values are transplanted patients.

[Table 5.2 continue].

Country	Chronic *Pseudomonas aeruginosa* number (%)			Chronic *Burkholderia cepacia complex species* number (%)			Chronic *Staphylococcus aureus* number (%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Spain	19 (2.36)	688 (85.36)	99 (12.28)	24 (2.98)	764 (94.79)	18 (2.23)	19 (2.36)	468 (58.06)	319 (39.58)
Sweden	0 (0)	185 (79.40)	48 (20.60)	0 (0)	229 (98.28)	4 (1.72)	233 (100)	-	-
Switzerland	10 (2.81)	292 (82.02)	54 (15.17)	10 (2.81)	345 (96.91)	1 (0.28)	11 (3.09)	147 (41.29)	198 (55.62)
Ukraine	2 (2.13)	39 (41.49)	53 (56.38)	1 (1.06)	92 (97.87)	1 (1.06)	2 (2.13)	17 (18.09)	75 (79.79)
United Kingdom[2]	155 (3.65)	3647 (85.79)	449 (10.56)	0 (0)	4181 (98.35)	70 (1.65)	165 (3.88)	3707 (87.20)	379 (8.92)

[2] United Kingdom: chronicity for *Pseudomonas aeruginosa* and *Staphylococcus aureus* is defined as: 3 or more positive isolates during the last 12 months. Information on *Burkholderia* is collected as follows: *Burkholderia* grown at annual review, not necessarily chronic.

This table shows, separately by country, the frequency of chronic *Pseudomonas aeruginosa*, chronic *Burkholderia cepacia complex species* and chronic *Staphylococcus aureus* in children. The number of missing values is also included. The identification rate of *Burkholderia cepacia complex species* in particular may also be influenced by differences in culture techniques employed.

Table 5.3 Prevalence of chronic bacterial infection in adults seen in 2013, by country.

Country	Chronic *Pseudomonas aeruginosa* number (%)			Chronic *Burkholderia cepacia complex species* number (%)			Chronic *Staphylococcus aureus* number (%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Austria	1 (0.49)	95 (46.57)	108 (52.94)	5 (2.45)	186 (91.18)	13 (6.37)	3 (1.47)	99 (48.53)	102 (50.00)
Belgium[1]	144 (22.19)	254 (39.14)	251 (38.67)	149 (22.96)	475 (73.19)	25 (3.85)	649 (100)	-	-
Czech Republic	93 (36.61)	81 (31.89)	80 (31.50)	111 (43.70)	95 (37.40)	48 (18.90)	98 (38.58)	75 (29.53)	81 (31.89)
Denmark	0 (0)	149 (53.41)	130 (46.59)	0 (0)	251 (89.96)	28 (10.04)	279 (100)	-	-
France	0 (0)	2117 (66.41)	1071 (33.59)	0 (0)	3135 (98.34)	53 (1.66)	3188 (100)	-	-
Greece	1 (2.94)	8 (23.53)	25 (73.53)	1 (2.94)	33 (97.06)	0 (0)	1 (2.94)	25 (73.53)	8 (23.53)
Hungary	61 (25.42)	91 (37.92)	88 (36.67)	61 (25.42)	173 (72.08)	6 (2.50)	61 (25.42)	102 (42.50)	77 (32.08)
Ireland	6 (1.19)	225 (44.73)	272 (54.08)	6 (1.19)	482 (95.83)	15 (2.98)	6 (1.19)	336 (66.80)	161 (32.01)
Israel	9 (3.13)	113 (39.24)	166 (57.64)	10 (3.47)	276 (95.83)	2 (0.69)	9 (3.13)	199 (69.1)	80 (27.78)
Italy	308 (11.87)	1141 (43.99)	1145 (44.14)	308 (11.87)	2172 (83.73)	114 (4.39)	308 (11.87)	1187 (45.76)	1099 (42.37)
Latvia	0 (0)	2 (22.22)	7 (77.78)	0 (0)	7 (77.78)	2 (22.22)	0 (0)	5 (55.56)	4 (44.44)
Lithuania	0 (0)	11 (84.62)	2 (15.38)	0 (0	10 (79.92)	3 (23.08)	0 (0)	4 (30.77)	9 (69.23)
Rep of Macedonia	0 (0)	9 (40.91)	13 (59.09)	0 (0)	21 (95.45)	1 (4.55)	0 (0)	15 (68.18)	7 (31.82)
Rep of Moldova	0 (0)	6 (46.15)	7 (53.85)	10 (76.92)	3 (23.08)	0 (0)	0 (0)	6 (46.15)	7 (53.85)
The Netherlands	50 (6.82)	353 (48.16)	330 (45.02)	48 (6.55)	667 (91.00)	18 (2.46)	48 (6.55)	405 (55.25)	280 (38.20)
Portugal	1 (0.81)	73 (59.35)	49 (39.84)	1 (0.81)	115 (93.50)	7 (5.69)	1 (0.81)	65 (52.85)	57 (46.34)
Romania	0 (0)	1 (100)	0 (0)	0 (0)	1 (100)	0 (0)	0 (0)	1 (100)	0 (0)
Russian Federation	39 (7.04)	249 (44.95)	266 (48.01)	44 (7.94)	424 (76.53)	86 (15.52)	47 (8.48)	254 (45.85)	253 (45.67)
Serbia	1 (2.27)	9 (20.45)	34 (77.27)	1 (2.27)	35 (79.55)	8 (18.18)	2 (4.55)	20 (45.45)	22 (50.00)
Slovak Republic	6 (6.98)	39 (45.35)	41 (47.67)	6 (6.98)	70 (81.40)	10 (11.63)	6 (6.98)	45 (52.33)	35 (40.70)
Slovenia	2 (9.09)	14 (63.64)	6 (27.27)	2 (9.09)	18 (81.82)	2 (9.09)	2 (9.09)	9 (40.91)	11 (50.00)

[1] Belgium: most of the patients that have missing values are transplanted patients.

[Table 5.3 continued]

Country	Chronic *Pseudomonas aeruginosa* number (%)			Chronic *Burkholderia cepacia complex species* number (%)			Chronic *Staphylococcus aureus* number (%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Spain	38 (6.70)	236 (41.62)	293 (51.68)	39 (6.88)	485 (85.54)	43 (7.58)	37 (6.53)	289 (50.97)	241 (42.50)
Sweden	0 (0)	158 (41.47)	223 (58.53)	0 (0)	366 (96.06)	15 (3.94)	381 (100)	-	-
Switzerland	9 (2.94)	129 (42.16)	168 (54.9)	9 (2.94)	281 (91.83)	16 (5.23)	9 (2.94)	147 (48.04)	150 (49.02)
Ukraine	0 (0)	1 (9.09)	10 (90.91)	1 (9.09)	10 (90.91)	0 (0)	0 (0)	0 (0)	11 (100)
United Kingdom[2]	61 (1.27)	2227 (46.41)	2511 (52.32)	0 (0)	4543 (94.67)	256 (5.33)	84 (1.75)	3583 (74.66)	1132 (23.59)

[2] United Kingdom: chronicity for *Pseudomonas aeruginosa* and *Staphylococcus aureus* is defined as: 3 or more positive isolates during the last 12 months. Information on *Burkholderia* is collected as follows: *Burkholderia* grown at annual review, not necessarily chronic.

This table shows, separately by country, the frequency of chronic *Pseudomonas aeruginosa*, chronic *Burkholderia cepacia complex species* and chronic *Staphylococcus aureus in adults*. The number of missing values is also included. The identification rate of *Burkholderia cepacia complex species* in particular may also be influenced by differences in culture techniques employed.

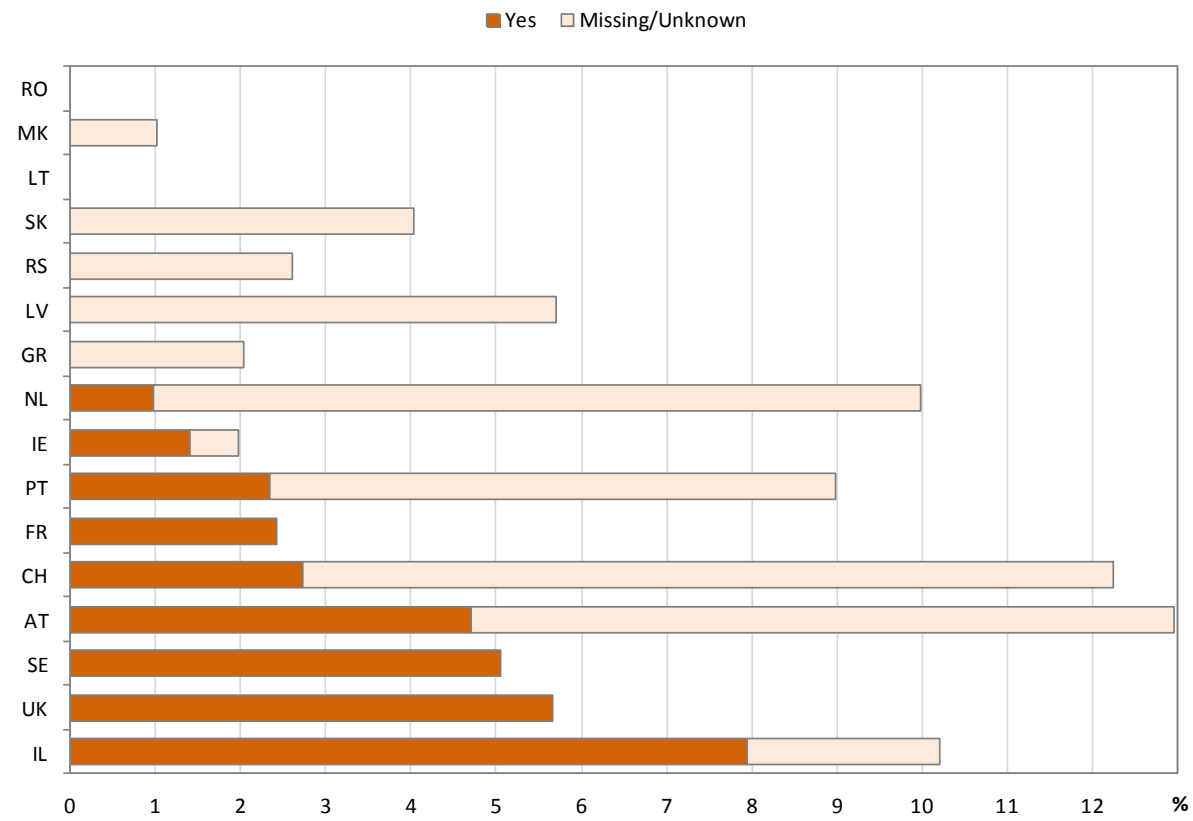
Table 5.4 Prevalence of non-tuberculous mycobacteria and Stenotrophomonas maltophilia infection in all patients seen in 2013, by country.

Country	Non-tuberculous mycobacteria (NTM) infection this year number (%)			*Stenotrophomonas maltophilia* infection this year number (%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Austria	44 (8.27)	463 (87.03)	25 (4.70)	9 (1.69)	460 (86.47)	63 (11.84)
Belgium[1]	136 (11.80)	1009 (87.51)	8 (0.69)	136 (11.80)	898 (77.88)	119 (10.32)
Czech Republic	342 (58.16)	233 (39.63)	13 (2.21)	260 (44.22)	271 (46.09)	57 (9.69)
Denmark	466 (100)	-	-	466 (100)	-	-
France	0 (0)	6134 (97.58)	152 (2.42)	0 (0)	5624 (89.47)	662 (10.53)
Greece	2 (2.04)	96 (97.96)	0 (0)	2 (2.04)	82 (83.67)	14 (14.29)
Hungary	162 (32.02)	335 (66.21)	9 (1.78)	90 (17.79)	400 (79.05)	16 (3.16)
Ireland	6 (0.56)	1042 (98.02)	15 (1.41)	6 (0.56)	968 (91.06)	89 (8.37)
Israel	12 (2.27)	475 (89.79)	42 (7.94)	13 (2.46)	486 (91.87)	30 (5.67)
Italy	743 (15.57)	3996 (83.76)	32 (0.67)	743 (15.57)	3831 (80.30)	197 (4.13)
Latvia	2 (5.71)	33 (94.29)	0 (0)	2 (5.71)	29 (82.86)	4 (11.43)
Lithuania	0 (0)	13 (100)	0 (0)	0 (0)	11 (84.62)	2 (15.38)
Rep of Macedonia	1 (1.02)	97 (98.98)	0 (0)	1 (1.02)	97 (98.98)	0 (0)
Rep of Moldova	59 (96.72)	2 (3.28)	0 (0)	22 (36.07)	37 (60.66)	2 (3.28)
The Netherlands	121 (9.02)	1207 (90.01)	13 (0.97)	52 (3.88)	1146 (85.46)	143 (10.66)
Portugal	17 (6.64)	233 (91.02)	6 (2.34)	1 (0.39)	231 (90.23)	24 (9.38)
Romania	0 (0)	41 (100)	0 (0)	27 (65.85)	14 (34.15)	0 (0)
Russian Federation	806 (41.94)	1107 (57.60)	9 (0.47)	87 (4.53)	1768 (91.99)	67 (3.49)
Serbia	4 (2.60)	150 (97.40)	0 (0)	1 (0.65)	144 (93.51)	9 (5.84)
Slovak Republic	6 (4.03)	143 (95.97)	0 (0)	6 (4.03)	137 (91.95)	6 (4.03)
Slovenia	9 (11.11)	72 (88.89)	0 (0)	12 (14.81)	65 (80.25)	4 (4.94)
Spain	246 (17.90)	1082 (78.75)	46 (3.35)	57 (4.15)	1224 (89.08)	93 (6.77)
Sweden	0 (0)	583 (94.95)	31 (5.05)	0 (0)	559 (91.04)	55 (8.96)
Switzerland	63 (9.52)	581 (87.76)	18 (2.72)	46 (6.95)	542 (81.87)	74 (11.18)
Ukraine	105 (100)	-	-	2 (1.90)	102 (97.14)	1 (0.95)
United Kingdom	0 (0)	8538 (94.34)	512 (5.66)	0 (0)	8547 (94.44)	503 (5.56)

[1] Belgium: most of the patients that have missing values are transplanted patients.

This table shows the frequency of two other infections, non-tuberculous mycobacteria (NTM) and *Stenotrophomonas maltophilia.* Both these infections seem to be relatively rare, in line with the frequencies of *Burkholderia* infection. The identification rate of these bacteria may also be influenced by differences in culture techniques employed.

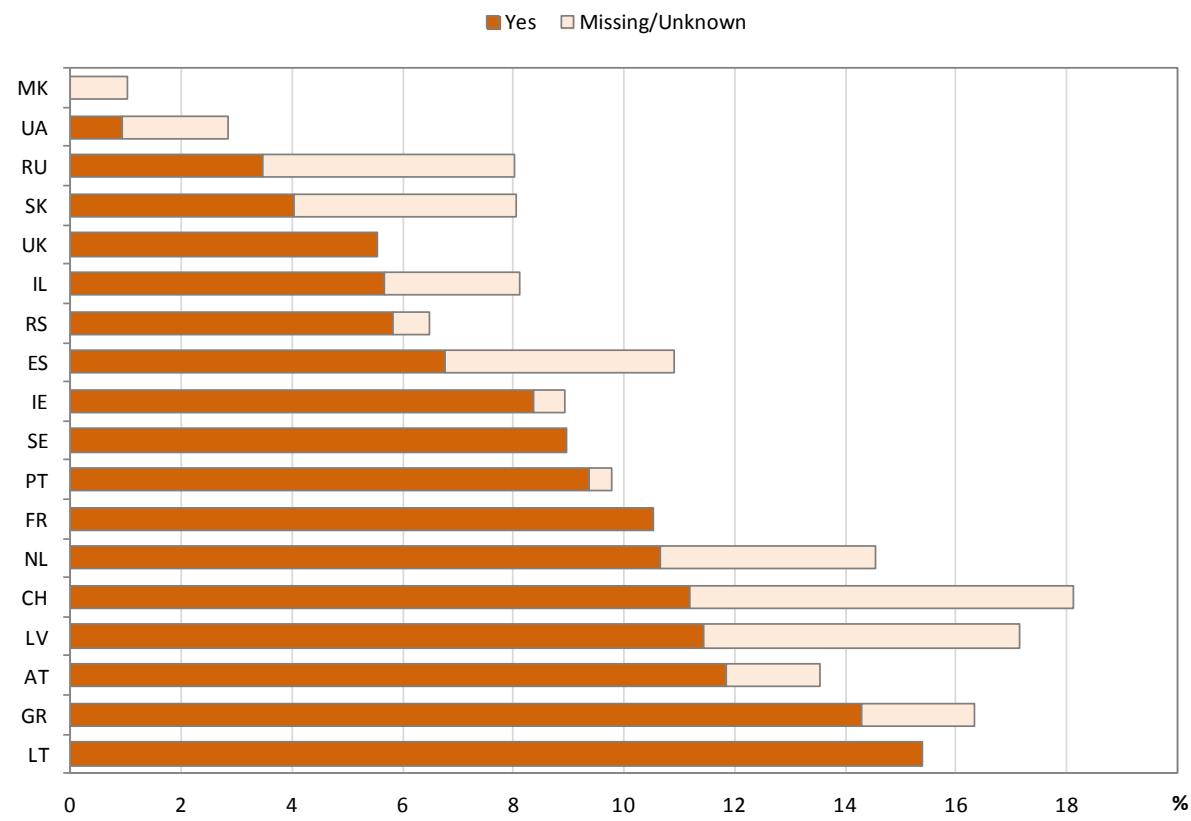
Figure 5.4 Prevalence of non-tuberculous mycobacteria in all patients seen in 2013, by country.



Note: we excluded from the graph the countries for which the information on non-tuberculous mycobacteria was missing for more than 10% of the patients.
Note: Belgium: most of the patients that have missing values are transplanted patients.

The horizontal bars represent the percentage of patients with non-tuberculous mycobacteria infection (in dark orange) and the percentage of patients where information on non-tuberculous mycobacteria infection was missing (in light orange). Generally, infections from these bacteria are not very frequent in any country.

Figure 5.5 Prevalence of Stenotrophomonas maltophilia infection in all patients seen in 2013, by country.



Note: We excluded from the graph the countries for which the information on *Stenotrophomonas maltophilia* was missing for more than 10% of the patients.
Note: Belgium: most of the patients that have missing values are transplanted patients.

The horizontal bars represent the percentage of patients with *Stenotrophomonas maltophilia* infection (in dark orange) and the percentage of patients where information on *Stenotrophomonas maltophilia* was missing (light orange). The frequency varies considerably between countries.

Table 5.5 Prevalence of non-tuberculous mycobacteria and Stenotrophomonas maltophilia infection in children seen in 2013, by country.

Country	Non-tuberculous mycobacteria (NTM) infection this year number (%)			*Stenotrophomonas maltophilia* infection this year number (%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Austria	37 (11.28)	282 (85.98)	9 (2.74)	6 (1.83)	287 (87.5)	35 (10.67)
Belgium[1]	4 (0.79)	500 (99.21)	0 (0)	4 (0.79)	444 (88.1)	56 (11.11)
Czech Republic	279 (83.53)	53 (15.87)	2 (0.60)	137 (41.02)	158 (47.31)	39 (11.68)
Denmark	187 (100)	-	-	187 (100)	-	-
France	0 (0)	3058 (98.71)	40 (1.29)	0 (0)	2740 (88.44)	358 (11.56)
Greece	1 (1.56)	63 (98.44)	0 (0)	0 (0)	53 (82.81)	11 (17.19)
Hungary	80 (30.08)	186 (69.92)	0 (0)	21 (7.89)	233 (87.59)	12 (4.51)
Ireland	0 (0)	553 (98.75)	7 (1.25)	0 (0)	504 (90.00)	56 (10.00)
Israel	3 (1.24)	223 (92.53)	15 (6.22)	4 (1.66)	217 (90.04)	20 (8.30)
Italy	434 (19.94)	1734 (79.69)	8 (0.37)	434 (19.94)	1660 (76.29)	82 (3.77)
Latvia	2 (7.69)	24 (92.31)	0 (0)	2 (7.69)	20 (76.92)	4 (15.38)
Lithuania	0 -	0 -	0 -	0 -	0 -	0 -
Rep of Macedonia	1 (1.32)	75 (98.68)	0 (0)	1 (1.32)	75 (98.68)	0 (0)
Rep of Moldova	48 (100)	-	-	17 (35.42)	30 (62.50)	1 (2.08)
The Netherlands	28 (4.61)	578 (95.07)	2 (0.33)	4 (0.66)	544 (89.47)	60 (9.87)
Portugal	12 (9.02)	119 (89.47)	2 (1.50)	0 (0)	118 (88.72)	15 (11.28)
Romania	0 (0)	40 (100)	0 (0)	27 (67.50)	13 (32.50)	0 (0)
Russian Federation	557 (40.72)	807 (58.99)	4 (0.29)	43 (3.14)	1278 (93.42)	47 (3.44)
Serbia	2 (1.82)	108 (98.18)	0 (0)	0 (0)	101 (91.82)	9 (8.18)
Slovak Republic	0 (0)	63 (100)	0 (0)	0 (0)	60 (95.24)	3 (4.76)
Slovenia	0 (0)	59 (100)	0 (0)	0 (0)	57 (96.61)	2 (3.39)
Spain	130 (16.13)	654 (81.14)	22 (2.73)	20 (2.48)	721 (89.45)	65 (8.06)
Sweden	0 (0)	225 (96.57)	8 (3.43)	0 (0)	218 (93.56)	15 (6.44)
Switzerland	44 (12.36)	308 (86.52)	4 (1.12)	37 (10.39)	282 (79.21)	37 (10.39)
Ukraine	94 (100)	-	-	1 (1.06)	92 (97.87)	1 (1.06)
United Kingdom	0 (0)	4112 (96.73)	139 (3.27)	0 (0)	4025 (94.68)	226 (5.32)

[1] Belgium: most of the patients that have missing values are transplanted patients.

Table 5.6 Prevalence of non-tuberculous mycobacteria and Stenotrophomonas maltophilia infection in adults seen in 2013, by country.

Country	Non-tuberculous mycobacteria (NTM) infection this year number (%)			*Stenotrophomonas maltophilia* infection this year number (%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Austria	7 (3.43)	181 (88.73)	16 (7.84)	3 (1.47)	173 (84.80)	28 (13.73)
Belgium[1]	132 (20.34)	509 (78.43)	8 (1.23)	132 (20.34)	454 (69.95)	63 (9.71)
Czech Republic	63 (24.80)	180 (70.87)	11 (4.33)	123 (48.43)	113 (44.49)	18 (7.09)
Denmark	279 (100)	-	-	279 (100)	-	-
France	0 (0)	3076 (96.49)	112 (3.51)	0 (0)	2884 (90.46)	304 (9.54)
Greece	1 (2.94)	33 (97.06)	0 (0)	2 (5.88)	29 (85.29)	3 (8.82)
Hungary	82 (34.17)	149 (62.08)	9 (3.75)	69 (28.75)	167 (69.58)	4 (1.67)
Ireland	6 (1.19)	489 (97.22)	8 (1.59)	6 (1.19)	464 (92.25)	33 (6.56)
Israel	9 (3.13)	252 (87.50)	27 (9.38)	9 (3.13)	269 (93.4)	10 (3.47)
Italy	308 (11.87)	2262 (87.20)	24 (0.93)	308 (11.87)	2171 (83.69)	115 (4.43)
Latvia	0 (0)	9 (100)	0 (0)	0 (0)	9 (100)	0 (0)
Lithuania	0 (0)	13 (100)	0 (0)	0 (0)	11 (84.62)	2 (15.38)
Rep of Macedonia	0 (0)	22 (100)	0 (0)	0 (0)	22 (100)	0 (0)
Rep of Moldova	11 (84.62)	2 (15.38)	0 (0)	5 (38.46)	7 (53.85)	1 (7.69)
The Netherlands	93 (12.69)	629 (85.81)	11 (1.50)	48 (6.55)	602 (82.13)	83 (11.32)
Portugal	5 (4.07)	114 (92.68)	4 (3.25)	1 (0.81)	113 (91.87)	9 (7.32)
Romania	0 (0)	1 (100)	0 (0)	0 (0)	1 (100)	0 (0)
Russian Federation	249 (44.95)	300 (54.15)	5 (0.90)	44 (7.94)	490 (88.45)	20 (3.61)
Serbia	2 (4.55)	42 (95.45)	0 (0)	1 (2.27)	43 (97.73)	0 (0)
Slovak Republic	6 (6.98)	80 (93.02)	0 (0)	6 (6.98)	77 (89.53)	3 (3.49)
Slovenia	9 (40.91)	13 (59.09)	0 (0)	12 (54.55)	8 (36.36)	2 (9.09)
Spain	116 (20.46)	427 (75.31)	24 (4.23)	37 (6.53)	502 (88.54)	28 (4.94)
Sweden	0 (0)	358 (93.96)	23 (6.04)	0 (0)	341 (89.50)	40 (10.50)
Switzerland	19 (6.21)	273 (89.22)	14 (4.58)	9 (2.94)	260 (84.97)	37 (12.09)
Ukraine	11 (100)	-	-	1 (9.09)	10 (90.91)	0 (0)
United Kingdom	0 (0)	4426 (92.23)	373 (7.77)	0 (0)	4522 (94.23)	277 (5.77)

[1] Belgium: most of the patients that have missing values are transplanted patients.

6. Nutrition

Pancreatic insufficiency is usually defined as absence of pancreatic enzymes in two stool samples (or elevated levels of fat in stools). However, since information on both was rarely collected by the national registries, we used information on the use of pancreatic enzymes as an indicator of pancreatic insufficiency.

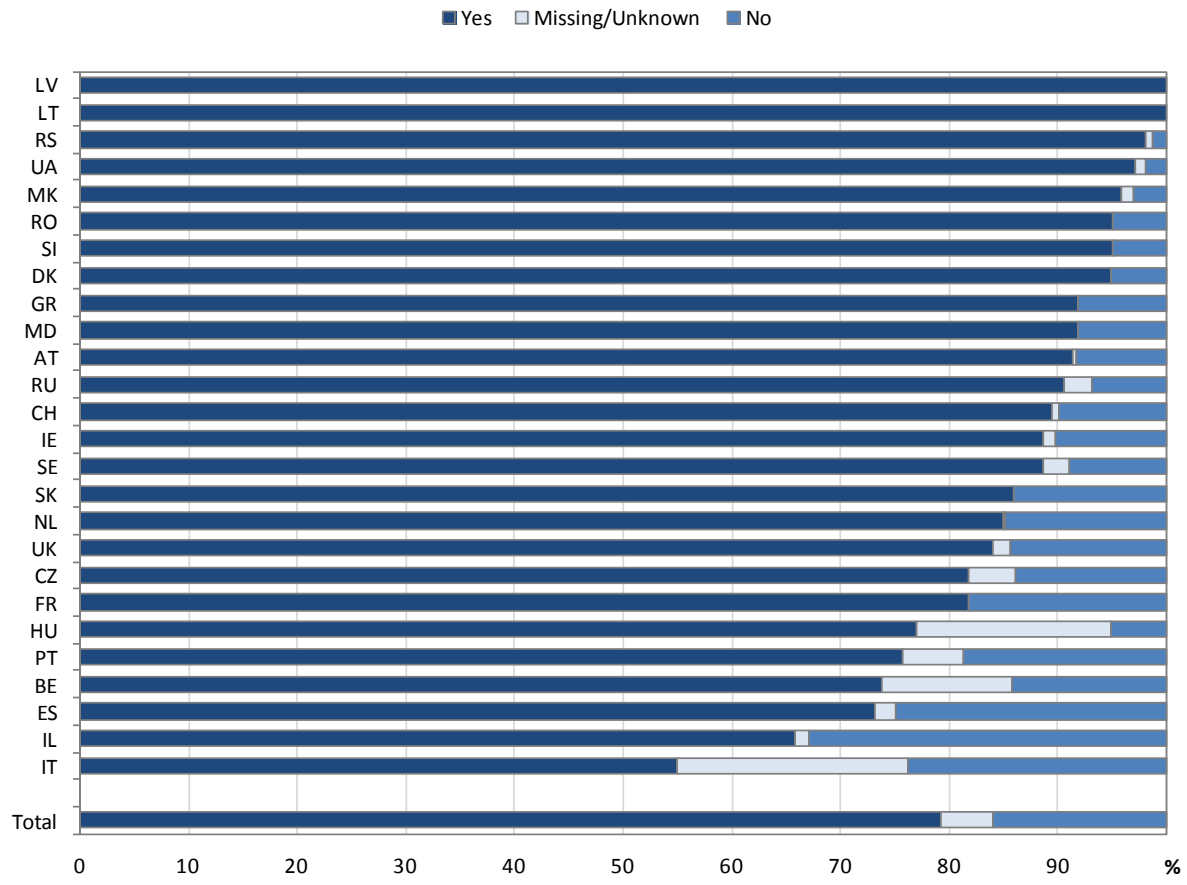
We collected weight and height measured at the time when the FEV_1 value was recorded, and, for patients that did not perform spirometry, the last measurements in the year were considered. From these raw values we calculated body mass index (BMI). A patient with a low weight is not necessarily underweight if the height is also low, and BMI may better illustrate the nutritional status: BMI describes the weight/height relationship and is considered a good measure of nutritional status. The ECFS Standards of Care recommend BMI of greater than 20 kg/m2[2].

Weight, height and BMI were then expressed in terms of so-called z-scores by using a reference population of healthy individuals (in this case the US population with reference values issued by the Centre for Disease Control, USA , see Appendix 1 on page 119 for details).

A z-score of 0 means that the height/weight/BMI is equal to the mean height/weight/BMI of people of the same age and sex of the reference population. A z-score of -2 means that the height/weight/BMI value is 2 standard deviations below the mean height/weight/BMI of people of the same age and sex of the reference population; a z-score of +2 means that the value is 2 standard deviations above that mean. In the reference population, 95% of all individuals have a z-score for weight between -2 and +2 (the same for height) and it is expected that the same happens for approximately 95% of individuals of a population without conditions that affect weight (or height). The average z-score for a largely healthy population should be very close to zero.

[2] A.R. Smyth et al, JCF 2014;13, S23–S42

Figure 6.1 Use of pancreatic enzymes in 2013 for all patients, by country and overall.



Note: For Belgium most of the patients that have missing values are transplanted patients.

This graph shows the use of pancreatic enzymes by country. This can be seen as an informed estimate of pancreatic insufficiency.

Table 6.1 Number of patients for whom height and weight measurements were available. All patients seen in 2013.

Country	Number of patients	Height		Weight	
		N	N miss	N	N miss
Austria	532	522	10	522	10
Belgium[1]	1153	1012	141	1012	141
Czech Republic	588	509	79	509	79
Denmark	466	455	11	455	11
France	6286	6109	177	6099	187
Greece	98	80	18	80	18
Hungary	506	418	88	421	85
Ireland	1063	961	102	966	97
Israel	529	506	23	507	22
Italy	4771	3361	1410	3373	1398
Latvia	35	18	17	18	17
Lithuania	13	12	1	12	1
Rep of Macedonia	98	97	1	97	1
Rep of Moldova	61	61	0	61	0
The Netherlands	1341	1337	4	1336	5
Portugal	256	233	23	233	23
Romania	41	25	16	25	16
Russian Federation	1922	1739	183	1769	153
Serbia	154	150	4	151	3
Slovak Republic	149	104	45	104	45
Slovenia	81	80	1	80	1
Spain	1374	1275	99	1279	95
Sweden	614	606	8	602	12
Switzerland	662	649	13	651	11
Ukraine	105	81	24	81	24
United Kingdom	9050	8873	177	8920	130

[1] Belgium: most of the patients that have missing values are transplanted patients.

Table 6.2 Z-scores for height: descriptive statistics by country. Patients aged 17 years or younger.

Country	N	Mean	Min	25th pctl (25% of the patients are below this z-score for height)	Median (50% of the patients are below this z-score for height)	75th pctl (75% of the patients are below this z-score for height)	Max
Austria	332	0.0	-4.6	-0.7	-0.1	0.6	7.5
Belgium[1]	512	-0.4	-4.8	-1	-0.4	0.3	2.3
Czech Republic	330	0.0	-8.4	-0.7	0.0	0.8	5.5
Denmark	196	-0.1	-2.8	-0.6	-0.1	0.5	2.5
France	3090	-0.5	-3.9	-1.1	-0.5	0.2	4.1
Greece	52	-0.3	-2.5	-1.1	-0.5	0.5	2.9
Hungary	251	0.0	-5.2	-1.0	0.1	1.0	7.6
Ireland	544	-0.3	-4.1	-1.0	-0.3	0.3	3.5
Israel	234	-0.6	-3.0	-1.3	-0.6	0.2	2.0
Italy	1310	-0.3	-5.7	-0.9	-0.2	0.4	3.1
Latvia	14	-0.1	-1.9	-0.9	-0.1	0.4	1.8
Rep of Macedonia	76	-0.8	-4.7	-1.7	-0.9	0.1	1.9
Rep of Moldova	48	-0.8	-4.8	-2.2	-1.2	0.6	5.0
The Netherlands	626	0.2	-3.8	-0.5	0.3	0.8	7.9
Portugal	120	-0.8	-5.9	-1.4	-0.7	0.0	4.4
Romania	25	-0.5	-3.2	-1.5	-0.6	0.2	3.0
Russian Federation	1284	-0.5	-8.5	-1.3	-0.5	0.4	6.5
Serbia	108	-0.2	-3.5	-1.0	-0.2	0.6	2.7
Slovak Republic	22	0.4	-1.3	-0.5	0.5	1.0	2.3
Slovenia	60	0.0	-2.6	-0.8	-0.2	0.9	3.7
Spain	766	-0.3	-3.6	-1	-0.3	0.4	8.4
Sweden	241	0.0	-2.5	-0.7	0.0	0.5	3.1
Switzerland	359	-0.4	-3.5	-1.0	-0.4	0.2	2.5
Ukraine	70	-0.8	-5.6	-1.5	-0.7	-0.1	2.9
United Kingdom	4270	-0.3	-9.8	-1.0	-0.3	0.4	3.5

[1] Belgium: most of the patients that have missing values are transplanted patients.

This table reports the median z-score for height (the value that separates the highest and lowest half of the patients), the mean z-score for height (the average) and other descriptive statistics for children (17 years or younger).

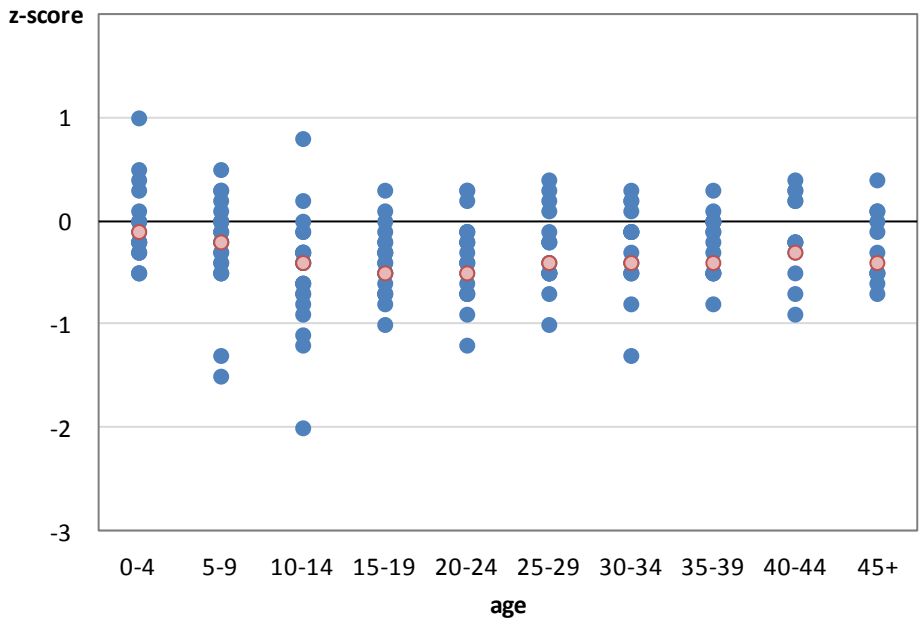
Table 6.3 Z-scores for height: descriptive statistics by country. Patients aged 18 years or older.

Country	N	Mean	Min	25th pctl (25% of the patients are below this z-score for height)	Median (50% of the patients are below this z-score for height)	75th pctl (75% of the patients are below this z-score for height)	Max
Austria	190	-0.2	-3.3	-0.8	-0.2	0.3	2.1
Belgium[1]	500	-0.3	-3.6	-1	-0.3	0.4	3.2
Czech Republic	179	-0.1	-2.6	-0.7	-0.1	0.5	3.1
Denmark	259	0.1	-3.4	-0.7	0.0	0.7	3.2
France	3019	-0.6	-5.8	-1.2	-0.5	0.1	3.0
Greece	28	-0.5	-2.2	-1.3	-0.2	0.1	1.2
Hungary	167	-0.2	-3.2	-1.0	-0.2	0.6	3.6
Ireland	417	-0.4	-2.8	-1.0	-0.4	0.3	2.1
Israel	272	-0.6	-4.7	-1.3	-0.5	0.0	2.3
Italy	2051	-0.6	-4.4	-1.2	-0.6	0.1	3.5
Latvia	4	0.3	-0.7	-0.5	0.3	1.2	1.4
Lithuania	12	0.5	-2.2	-0.1	0.5	1.4	2.4
Rep of Macedonia	21	-0.5	-2.7	-1.1	-0.5	-0.3	2.6
Rep of Moldova	13	-0.3	-2.6	-1.2	-0.5	1.0	2.0
The Netherlands	711	0.3	-3.4	-0.4	0.4	1.0	3.9
Portugal	113	-0.8	-3.2	-1.4	-1.0	-0.1	1.3
Russian Federation	455	-0.3	-3.7	-1.0	-0.3	0.4	3.4
Serbia	42	0.0	-2.5	-0.5	-0.1	0.6	2.4
Slovak Republic	82	0.1	-4.1	-0.5	0.2	0.9	2.4
Slovenia	20	-0.1	-1.6	-0.7	0.1	0.3	1.3
Spain	509	-0.7	-3.8	-1.3	-0.7	-0.1	2.0
Sweden	365	0.1	-2.9	-0.5	0.2	0.7	3.3
Switzerland	290	-0.2	-3.7	-0.8	-0.2	0.4	2.4
Ukraine	11	-0.4	-1.7	-1.2	-0.4	0.3	0.7
United Kingdom	4603	-0.4	-4.9	-1.0	-0.4	0.3	3.5

[1] Belgium: most of the patients that have missing values are transplanted patients.

This table reports the median z-score for height (the value that separates the highest and lowest half of the patients), the mean z-score for height (the average) and other descriptive statistics for adults (18 years or older).

Figure 6.2 Median z-scores for height by age group and by country. All patients seen in 2013.



Note: We excluded from the analyses those age groups where the number of patients was <10.

This graph shows the median z-scores for height by age group. Each country is represented by a dot (in blue) and the overall estimate is in red. The median z-scores for height tend to slowly decrease up to the teenage years and then rise again before levelling out. Since the z-scores are computed using healthy people as a reference, this pattern can be explained by the fact that CF patients reach the puberty growth spurt later than their peers, but then catch up. The graph also shows that there is large variability between countries.

Table 6.4 Z-scores for height: descriptive statistics by age group. All patients seen in 2013.

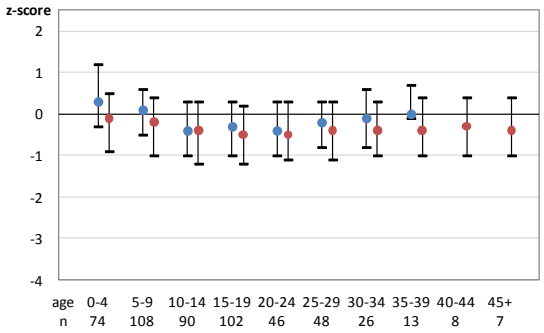
Age at height measurement	N	Mean	Min	25th pctl	Median	75th pctl	Max
0-4	3722	-0.2	-9.8	-0.9	-0.1	0.5	8.4
5-9	4421	-0.2	-5.9	-0.9	-0.2	0.4	6.7
10-14	4306	-0.5	-6.7	-1.2	-0.4	0.3	4.4
15-19	4071	-0.5	-5.8	-1.2	-0.5	0.2	3.2
20-24	3689	-0.5	-4.6	-1.1	-0.5	0.3	3.9
25-29	2907	-0.4	-4.7	-1.1	-0.4	0.3	3.6
30-34	2172	-0.3	-5.7	-1	-0.4	0.3	3.4
35-39	1513	-0.3	-4.1	-1	-0.4	0.4	3.3
40-44	1050	-0.3	-3.7	-1	-0.3	0.4	2.9
45+	1422	-0.3	-4.4	-1	-0.4	0.4	3.3

This table reports the median z-score for height and other descriptive statistics by age group for all the patients seen in 2013. The median values reported in this table are shown as red dots in fig 6.2.

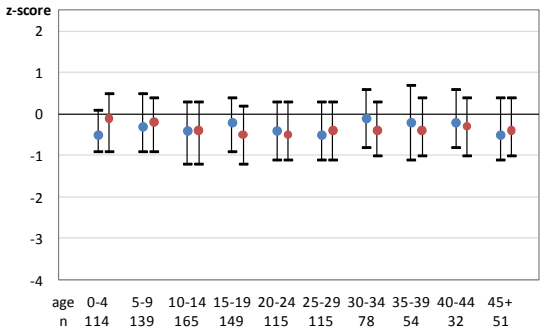
Figure 6.3 Quartiles of z-scores for height by age group and by country. All patients seen in 2013.

The figures below show the z-scores for height by country. The dot is the median and the whiskers show the 25th and 75th percentiles. In blue are the quartiles for the country, in red are the pooled quartiles computed on all other countries (i.e. excluding that country). We did not compute quartiles where the number of patients in the age group is <10, therefore there are no blue dots for those age groups (the number of patients in each age group is shown underneath the horizontal axis). We therefore excluded Latvia, Lithuania and Romania from the graphs because none of the age groups in these countries had more than 10 patients.

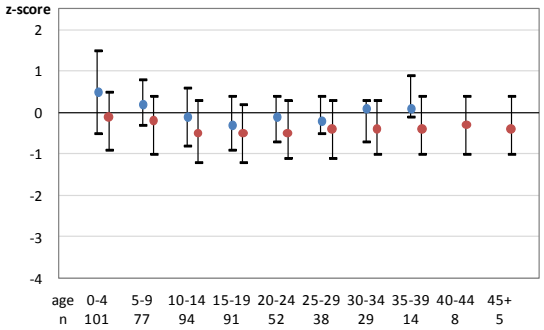
Quartiles of z-scores for height: Austria



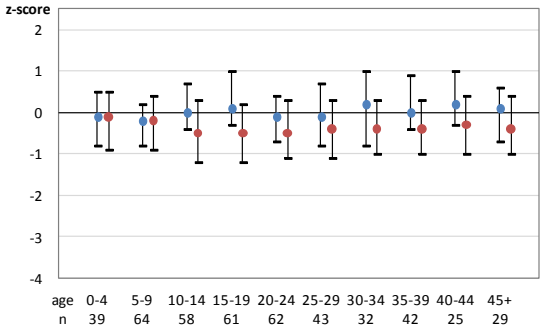
Quartiles of z-scores for height: Belgium[1]



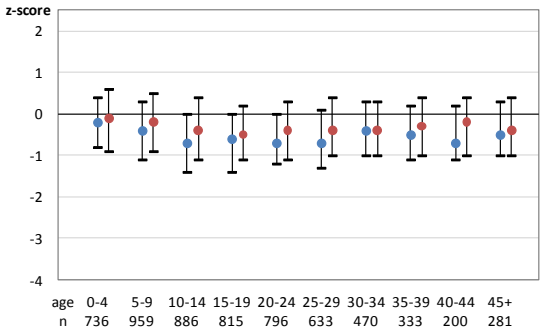
Quartiles of z-scores for height: Czech Republic



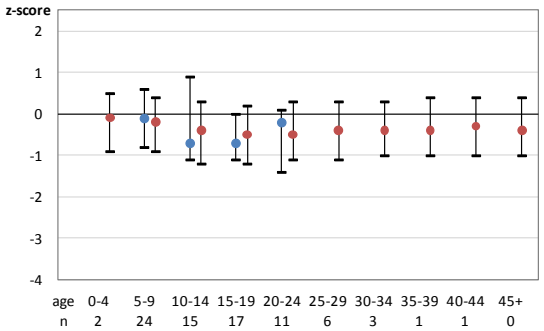
Quartiles of z-scores for height: Denmark



Quartiles of z-scores for height: France



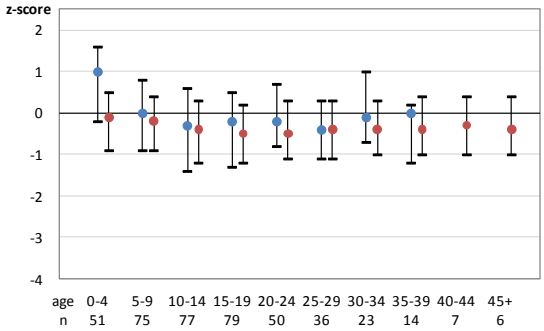
Quartiles of z-scores for height: Greece



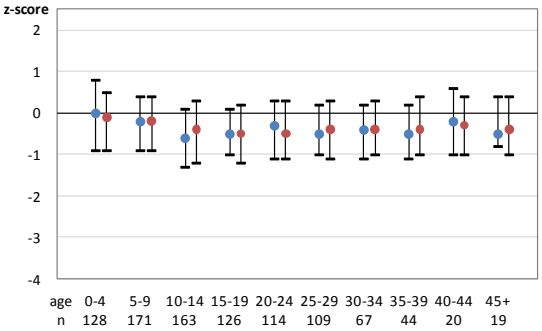
[1] Belgium: most of the patients that have missing values are transplanted patients.

[figure 6.3 continued]

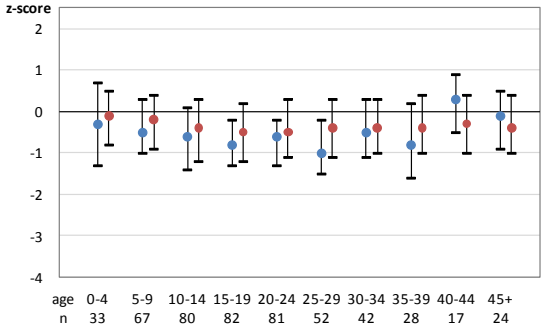
Quartiles of z-scores for height: Hungary



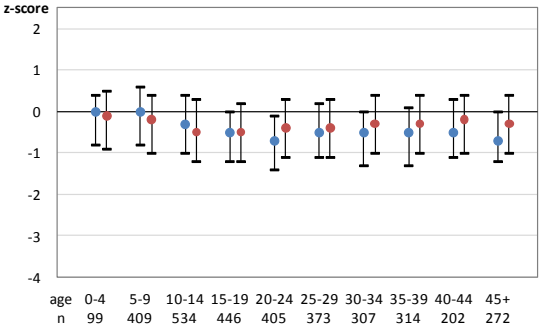
Quartiles of z-scores for height: Ireland



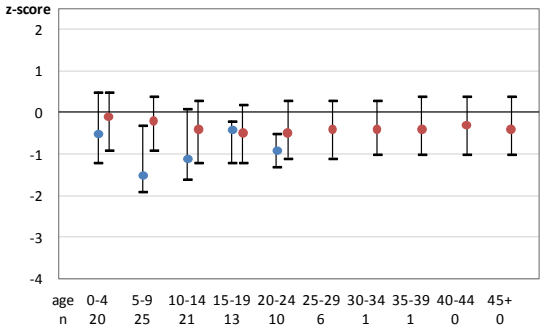
Quartiles of z-scores for height: Israel



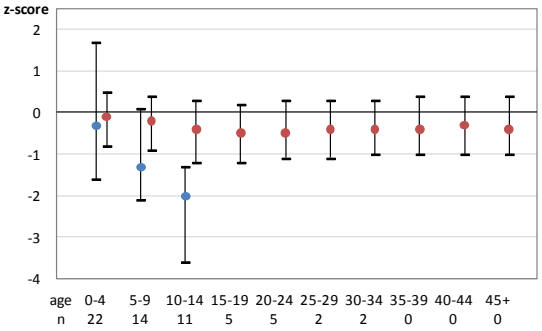
Quartiles of z-scores for height: Italy



Quartiles of z-scores for height: Rep of Macedonia

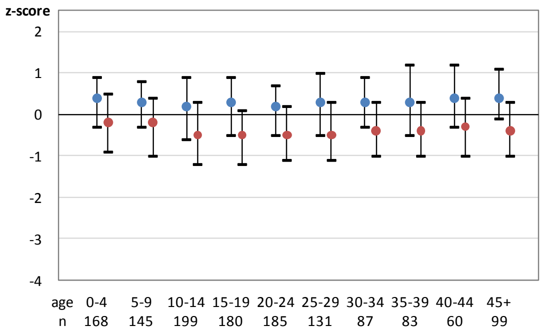


Quartiles of z-scores for height: Rep of Moldova

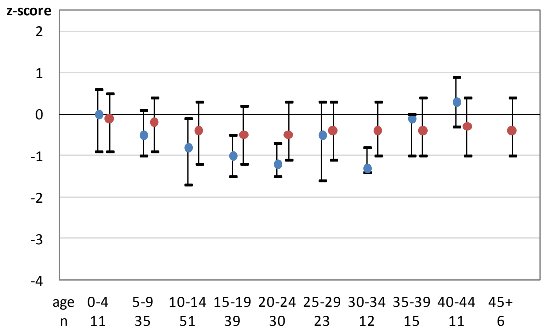


[figure 6.3 continued]

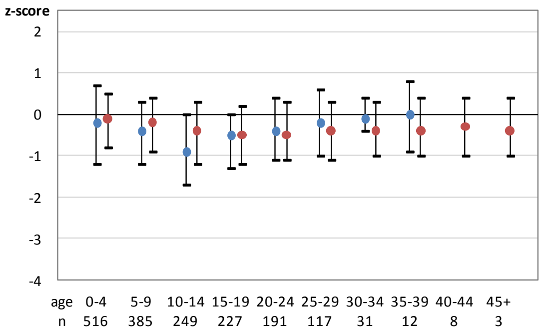
Quartiles of z-scores for height: The Netherlands



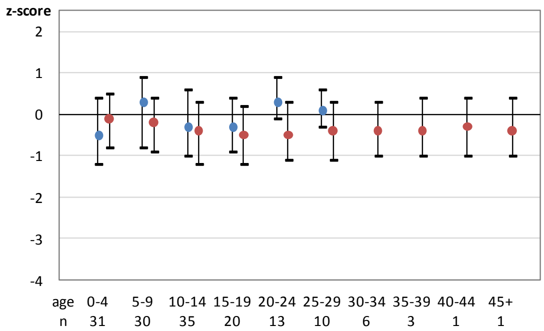
Quartiles of z-scores for height: Portugal



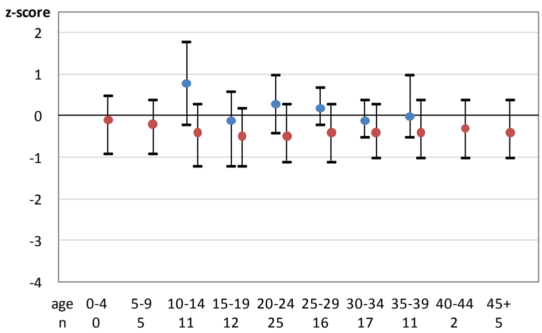
Quartiles of z-scores for height: Russian Federation



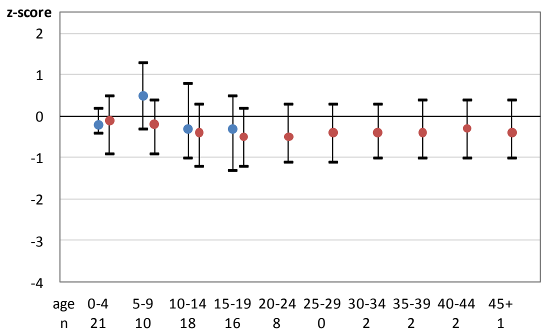
Quartiles of z-scores for height: Serbia



Quartiles of z-scores for height: Slovak Republic

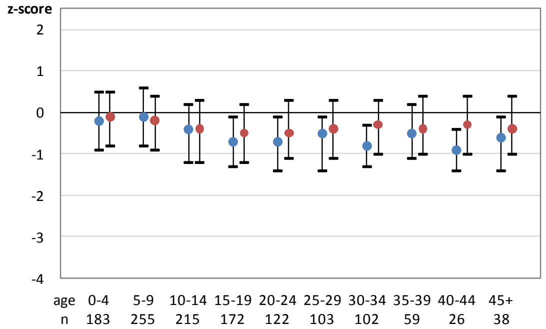


Quartiles of z-scores for height: Slovenia

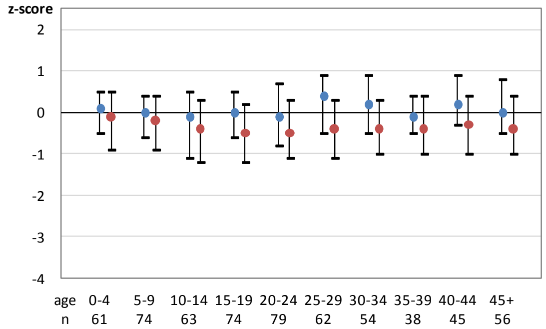


[figure 6.3 continued]

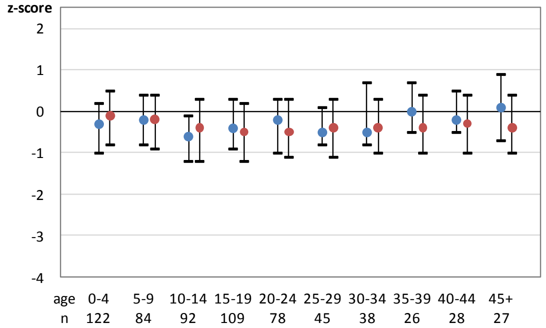
Quartiles of z-scores for height: Spain



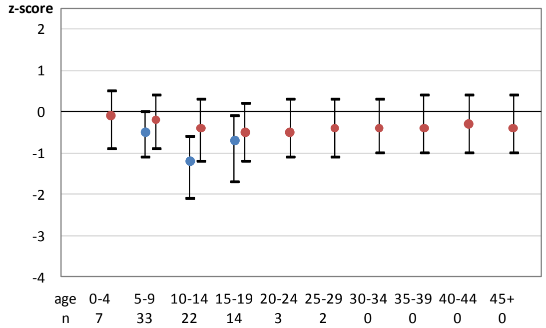
Quartiles of z-scores for height: Sweden



Quartiles of z-scores for height: Switzerland



Quartiles of z-scores for height: Ukraine



Quartiles of z-scores for height: United Kingdom

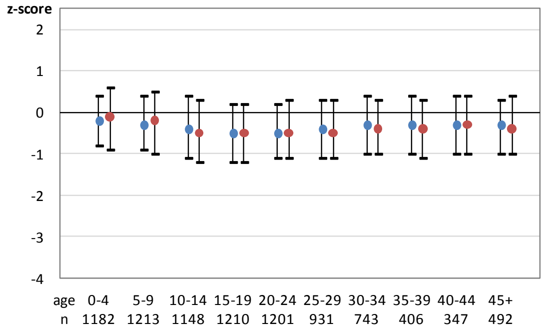


Table 6.5 Z-scores for weight: descriptive statistics by country. Patients aged 17 years or younger.

Country	N	Mean	Min	25th pctl (25% of the patients are below this z-score for weight)	Median (50% of the patients are below this z-score for weight)	75th pctl (75% of the patients are below this z-score for weight)	Max
Austria	332	-0.3	-6.9	-1.0	-0.2	0.3	4.5
Belgium[1]	512	-0.5	-5.8	-1.1	-0.4	0.3	2.5
Czech Republic	330	-0.2	-8.3	-0.9	-0.1	0.6	7.8
Denmark	196	-0.4	-4.6	-1.0	-0.4	0.2	1.7
France	3092	-0.6	-5.6	-1.3	-0.6	0.1	2.8
Greece	52	-0.1	-2.1	-0.9	-0.4	0.7	2.8
Hungary	254	-0.8	-7.6	-1.5	-0.4	0.2	2.5
Ireland	550	-0.2	-4.1	-0.8	-0.2	0.5	2.6
Israel	235	-0.5	-3.0	-1.3	-0.5	0.3	2.3
Italy	1313	-0.2	-5.5	-0.9	-0.2	0.5	3.2
Latvia	14	-0.9	-2.4	-1.9	-1.0	0.1	1.7
Rep of Macedonia	76	-0.5	-4.7	-1.4	-0.6	0.5	2.5
Rep of Moldova	48	-0.9	-8.4	-2.1	-0.9	0.5	4.4
The Netherlands	625	-0.1	-4.5	-0.6	0.0	0.5	2.9
Portugal	120	-0.9	-7.2	-1.2	-0.7	0	2.9
Romania	25	-0.9	-4.3	-1.5	-0.8	-0.1	1.9
Russian Federation	1312	-0.8	-7.4	-1.7	-0.7	0.1	4.2
Serbia	109	-0.4	-6.9	-1.1	-0.4	0.2	2.3
Slovak Republic	22	-0.1	-1.7	-0.8	-0.1	0.5	2
Slovenia	60	-0.5	-8.1	-1.1	-0.4	0.2	1.8
Spain	769	-0.3	-4.5	-1	-0.3	0.4	4.5
Sweden	241	-0.1	-3.0	-0.6	-0.1	0.5	1.8
Switzerland	362	-0.5	-8.1	-1.1	-0.4	0.2	2.9
Ukraine	70	-1.5	-6.8	-2.2	-1.2	-0.4	1.2
United Kingdom	4314	-0.2	-7.0	-0.9	-0.2	0.5	3.9

[1] Belgium: most of the patients that have missing values are transplanted patients.

This table reports the median z-score for weight (the value that separates the highest and lowest half of the patients), the mean z-score for weight (the average) and other descriptive statistics for children (17 years or younger).

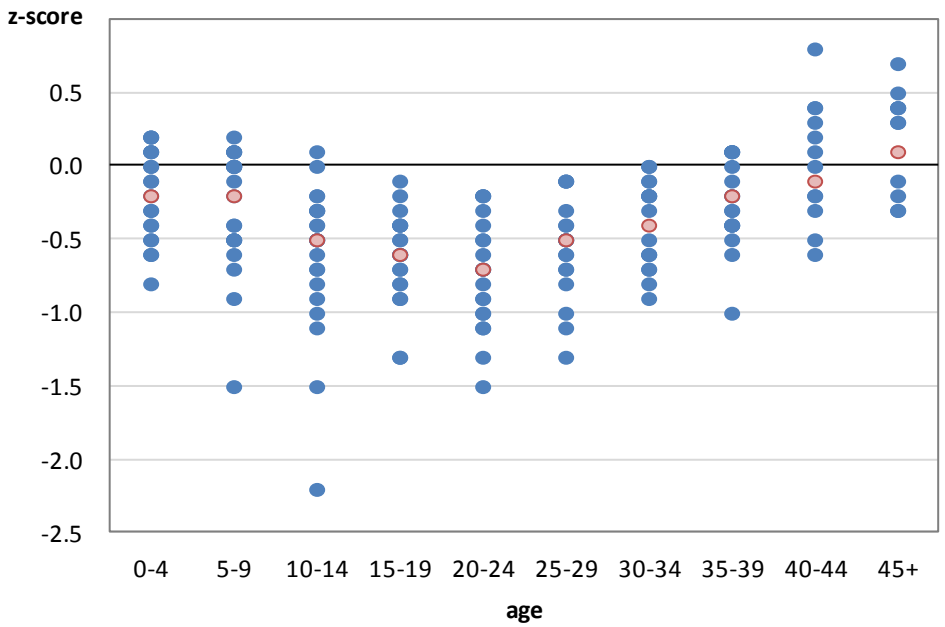
Table 6.6 Z-scores for weight: descriptive statistics by country. Patients aged 18 years or older.

Country	N	Mean	Min	25th pctl (25% of the patients are below this z-score for weight)	Median (50% of the patients are below this z-score for weight)	75th pctl (75% of the patients are below this z-score for weight)	Max
Austria	190	-0.7	-4.0	-1.4	-0.6	0.1	2.3
Belgium[1]	500	-0.5	-5.9	-1.2	-0.5	0.3	2.2
Czech Republic	179	-0.6	-5.4	-1.3	-0.5	0.2	2.1
Denmark	259	-0.4	-7.0	-1.0	-0.3	0.5	2.2
France	3007	-0.9	-9.9	-1.6	-0.9	-0.1	2.7
Greece	28	-0.8	-4.3	-1.6	-0.4	0.3	1.4
Hungary	167	-1.1	-8.1	-1.9	-1.0	-0.1	1.9
Ireland	416	-0.4	-5.6	-1.0	-0.4	0.2	2.8
Israel	272	-0.5	-4.2	-1.2	-0.4	0.4	3.0
Italy	2060	-0.6	-5.1	-1.2	-0.5	0.2	3.4
Latvia	4	-1.2	-1.9	-1.8	-1.5	-0.6	0.0
Lithuania	12	-0.5	-2.8	-1.2	-0.1	0.1	0.8
Rep of Macedonia	21	-0.8	-2	-1.3	-0.7	-0.5	1.2
Rep of Moldova	13	-1.4	-3.9	-2.5	-1.0	-0.3	0.4
The Netherlands	711	-0.1	-4.4	-0.7	-0.1	0.5	2.4
Portugal	113	-0.8	-4.0	-1.5	-0.6	0.2	2.4
Russian Federation	457	-1.4	-6.3	-2.2	-1.3	-0.5	2.4
Serbia	42	-1.0	-5.7	-1.2	-0.8	-0.2	1.0
Slovak Republic	82	-0.5	-3.9	-1.2	-0.2	0.4	2.1
Slovenia	20	-0.6	-2.2	-1.7	-0.4	0.3	0.4
Spain	510	-0.6	-5.5	-1.2	-0.5	0.1	2.4
Sweden	361	-0.2	-4.2	-0.7	-0.1	0.5	3.0
Switzerland	289	-0.6	-7.6	-1.1	-0.5	0.1	2.3
Ukraine	11	-1.4	-4.0	-1.9	-1.2	-0.7	-0.4
United Kingdom	4606	-0.3	-8.2	-1.0	-0.2	0.5	3.7

[1] Belgium: most of the patients that have missing values are transplanted patients.

This table reports the median z-score for weight (the value that separates the highest and lowest half of the patients), the mean z-score for weight (the average) and other descriptive statistics for adults (18 years or older).

Figure 6.4 Median z-scores for weight by age group and by country. All patients seen in 2013.



Note: We excluded from the analyses those age groups where the number of patients was <10.

This graph shows the median z-scores for weight by age group. Each country is represented by a dot (in blue) and the overall estimate is in red. Overall, the median z-scores for weight decrease from the third youngest age group to the 20-24 year age group before they increase in the older age groups. Again, the patients in the oldest age groups are patients that survived, and may therefore represent the patients with less disease severity. There is considerable variability between countries.

Table 6.7 Z-scores for weight: descriptive statistics by age group. All patients seen in 2013.

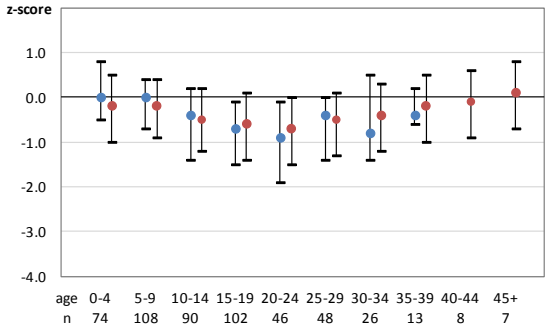
Age at weight measurement	N	Mean	Min	25th pctl	Median	75th pctl	Max
0-4	3800	-0.3	-7.2	-1	-0.2	0.5	7.8
5-9	4423	-0.2	-5.9	-0.9	-0.2	0.4	3.2
10-14	4318	-0.5	-8.1	-1.2	-0.5	0.2	3
15-19	4068	-0.7	-9.9	-1.4	-0.6	0.1	2.8
20-24	3696	-0.8	-8.2	-1.5	-0.7	0	2.7
25-29	2904	-0.6	-7.2	-1.3	-0.5	0.1	3.4
30-34	2170	-0.5	-8	-1.2	-0.4	0.3	3.7
35-39	1511	-0.3	-6.3	-1	-0.2	0.5	3
40-44	1047	-0.2	-5.5	-0.9	-0.1	0.6	3.2
45+	1426	0	-7.4	-0.7	0.1	0.8	3

This table reports the median z-score for weight and other descriptive statistics by age group for all the patients seen in 2013. The median values reported in this table are shown as red dots in fig 6.4.

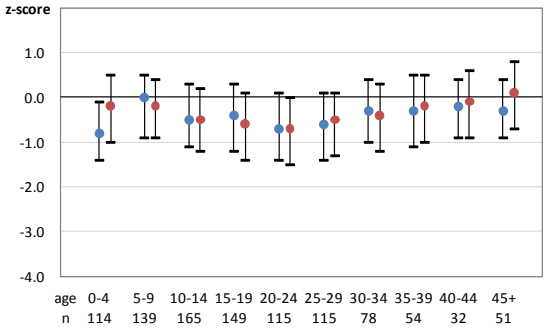
Figure 6.5 Quartiles of z-scores for weight by age group and by country. All patients seen in 2013.

The figures below show the z-scores for weight by country. The dot is the median, and the whiskers show the 25th and 75th percentiles. In blue are the quartiles for the country, in red are the pooled quartiles computed on all other countries (i.e. excluding that country). We did not compute quartiles where the number of patients in the age group is <10. Therefore there are no blue dots for those age groups (the number of patients in each age group is shown underneath the horizontal axis). We therefore excluded Latvia, Lithuania and Romania from the graphs because none of the age groups in these countries had more than 10 patients.

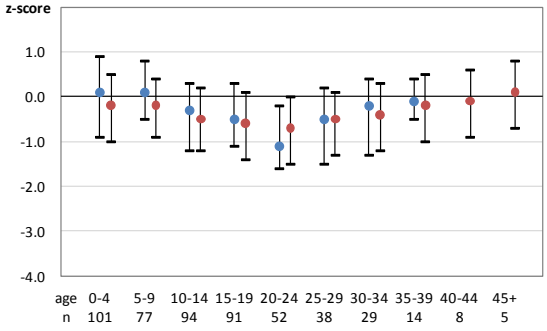
Quartiles of z-scores for weight: Austria



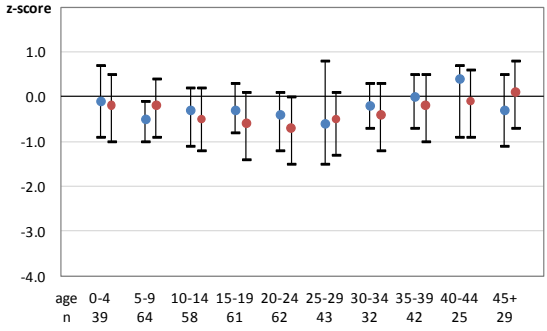
Quartiles of z-scores for weight: Belgium[1]



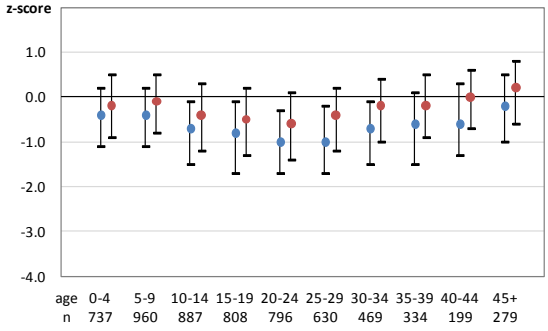
Quartiles of z-scores for weight: Czech Republic



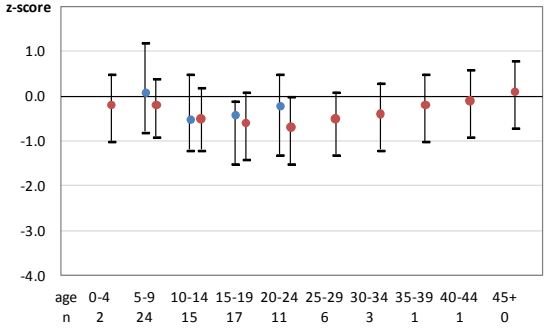
Quartiles of z-scores for weight: Denmark



Quartiles of z-scores for weight: France



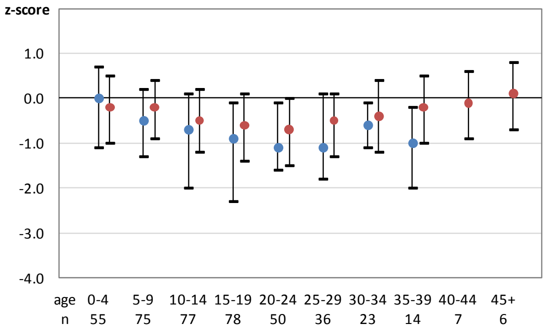
Quartiles of z-scores for weight: Greece



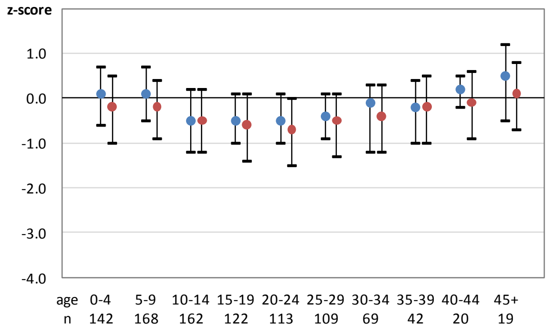
[1] Belgium: most of the patients that have missing values are transplanted patients.

[figure 6.5 continued]

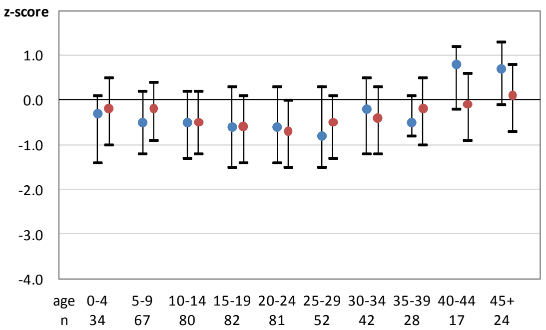
Quartiles of z-scores for weight: Hungary



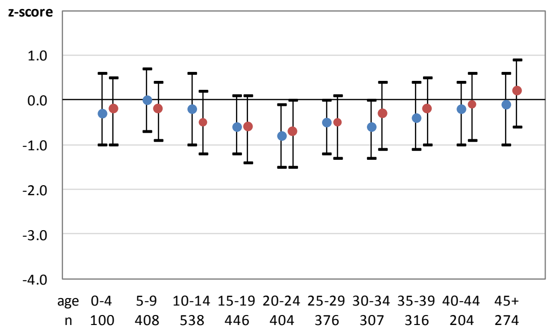
Quartiles of z-scores for weight: Ireland



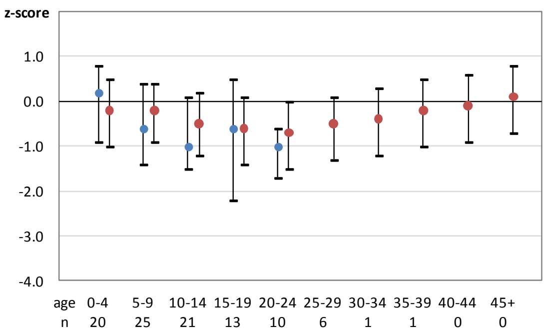
Quartiles of z-scores for weight: Israel



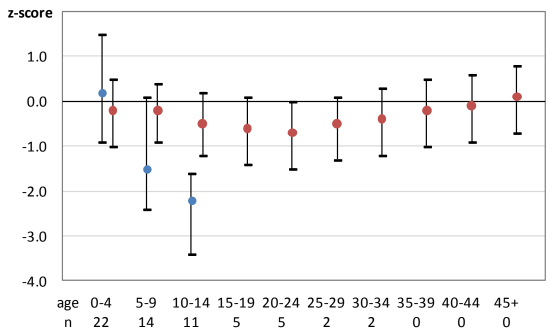
Quartiles of z-scores for weight: Italy



Quartiles of z-scores for weight: Rep of Macedonia

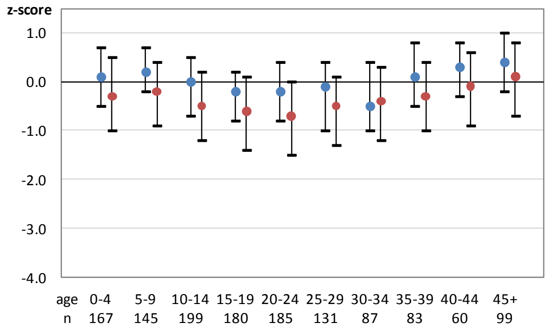


Quartiles of z-scores for weight: Rep of Moldova

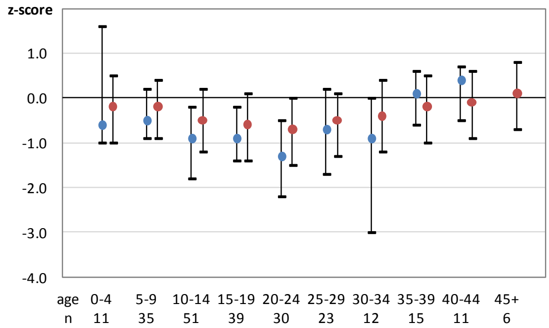


[figure 6.5 continued]

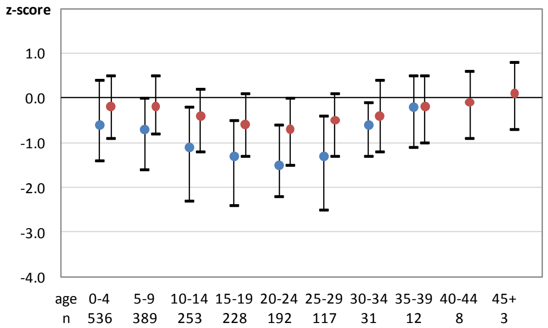
Quartiles of z-scores for weight: The Netherlands



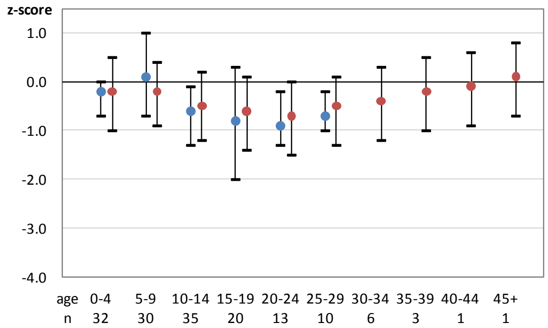
Quartiles of z-scores for weight: Portugal



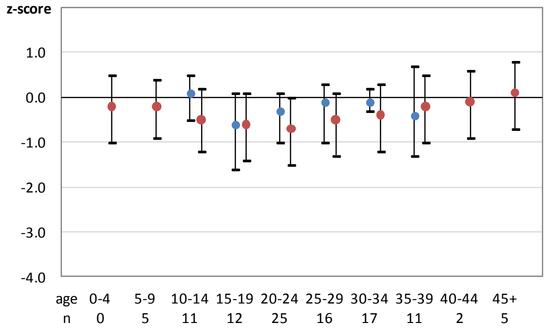
Quartiles of z-scores for weight: Russian Federation



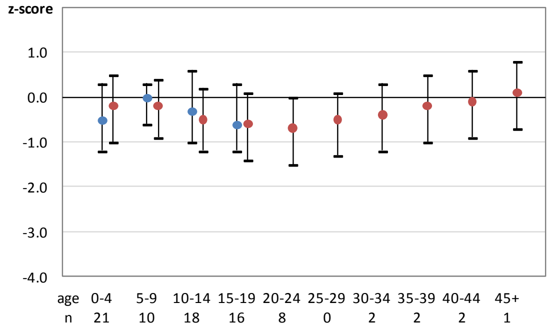
Quartiles of z-scores for weight: Serbia



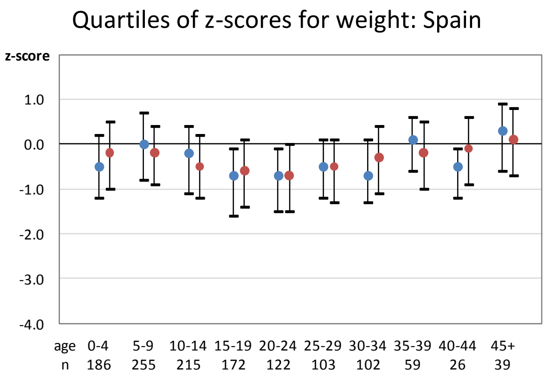
Quartiles of z-scores for weight: Slovak Republic

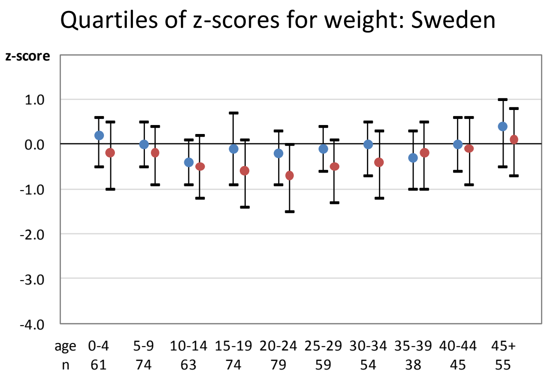


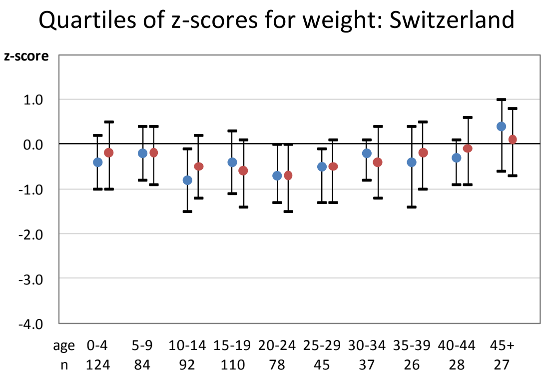
Quartiles of z-scores for weight: Slovenia

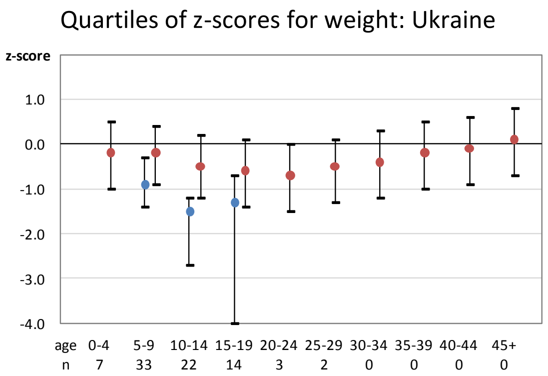


[figure 6.5 continued]









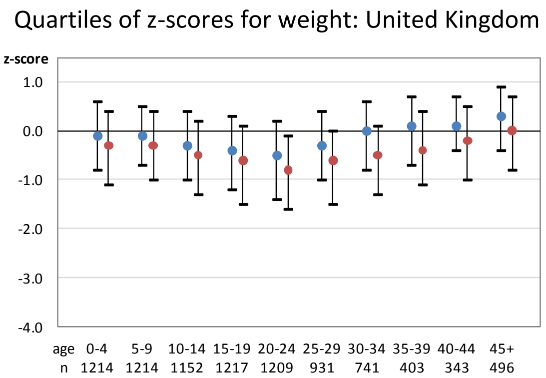


Table 6.8 Z-scores for BMI: descriptive statistics by country. All patients seen in 2013 aged 2-17 years.

Country	N	N Miss	Mean	Min	25th pctl (25% of the patients are below this z-score for BMI)	Median (50% of the patients are below this z-score for BMI)	75th pctl (75% of the patients are below this z-score for BMI)	Max
Austria	304	1	-0.4	-3.9	-1.0	-0.3	0.3	2.1
Belgium[1]	475	0	-0.3	-4.2	-1	-0.2	0.4	2.9
Czech Republic	294	3	-0.3	-4.6	-1.0	-0.3	0.5	1.9
Denmark	181	0	-0.5	-4.8	-1.0	-0.4	0.2	1.6
France	2841	9	-0.4	-6.7	-1.1	-0.4	0.2	2.7
Greece	52	0	0.1	-2.2	-0.5	0.0	0.7	2.5
Hungary	228	6	-1.1	-6.3	-1.8	-0.9	-0.1	2.1
Ireland	484	18	0.0	-4.1	-0.5	0.1	0.7	2.9
Israel	222	0	-0.2	-2.8	-0.8	-0.1	0.5	2.4
Italy	1286	227	-0.1	-7.1	-0.8	0.0	0.7	2.8
Latvia	14	0	-1.0	-2.7	-1.8	-1.2	-0.5	1.3
Rep of Macedonia	69	0	0	-2.8	-0.7	0	0.7	2.6
Rep of Moldova	41	0	-0.5	-5.5	-1.5	-0.5	0.4	4.0
The Netherlands	558	0	-0.2	-2.8	-0.7	-0.2	0.4	2.5
Portugal	116	1	-0.6	-5.7	-1.0	-0.5	0.1	2.0
Romania	24	0	-0.6	-3.6	-1.7	-0.4	0.3	1.5
Russian Federation	1061	9	-0.8	-8.7	-1.6	-0.6	0.1	3.7
Serbia	98	0	-0.3	-3.8	-1.0	-0.1	0.5	2.0
Slovak Republic	22	0	-0.4	-1.6	-1.0	-0.7	0.3	1.6
Slovenia	57	0	-0.6	-7.1	-1.3	-0.5	0.1	1.6
Spain	683	1	-0.1	-4.2	-0.8	-0.1	0.6	2.9
Sweden	229	2	-0.1	-3.0	-0.6	-0.1	0.4	2.3
Switzerland	311	3	-0.4	-9.0	-0.9	-0.3	0.3	2.4
Ukraine	67	0	-1.4	-7.5	-1.5	-1.1	-0.5	1.1
United Kingdom	3866	35	0.0	-7.5	-0.6	0.0	0.7	3.3

1 Belgium: most of the patients that have missing values are transplanted patients.

This table reports the median z-score for BMI, the mean z-score for BMI and other descriptive statistics for children aged 2 to 17 years, by country.

Table 6.9 BMI: descriptive statistics by country. All patients seen in 2013 aged 18 years or older.

Country	N	N Miss	Mean	Min	25th pctl (25% of the patients are below this BMI)	Median (50% of the patients are below this BMI)	75th pctl (75% of the patients are below this BMI)	Max
Austria	190	0	20.8	14.8	18.6	20.3	22.5	36.4
Belgium[1]	500	0	21.6	13.7	19.5	21.1	23.2	35.6
Czech Republic	179	33	20.8	13.4	18.6	20.4	22.6	34.2
Denmark	259	0	21.6	13.1	19.3	21.3	23.1	36.1
France	3003	28	20.9	12.9	18.8	20.5	22.5	42.4
Greece	28	0	21.3	15.8	18.5	21.1	22.7	32.0
Hungary	167	2	19.8	12.8	17.2	19.8	21.9	28.0
Ireland	409	20	22.1	13.2	20.0	21.8	23.8	42.6
Israel	272	0	22.5	15.4	19.9	22.2	24.5	42.6
Italy	2046	267	22.0	13.7	19.8	21.5	23.8	44.3
Latvia	4	0	18.3	16.1	16.7	18.5	20.0	20.3
Lithuania	12	1	20.0	16.2	17.9	20.2	21.6	25.0
Rep of Macedonia	21	0	20.7	17.3	19.6	20.9	22	23.5
Rep of Moldova	13	0	19.1	15.0	18.4	19.4	19.8	21.5
The Netherlands	711	0	21.9	15.6	19.8	21.6	23.5	39.0
Portugal	113	0	21.7	15.0	19.2	21.3	23.8	38.4
Russian Federation	455	9	19.3	12.7	17.3	18.8	21.0	35.9
Serbia	42	0	19.6	14.4	18.1	19.6	21.0	26.3
Slovak Republic	82	0	21.2	14.7	18.6	21.1	23.7	31.6
Slovenia	20	0	20.7	16.9	18.8	20.4	21.8	27.5
Spain	508	12	22	13.8	19.7	21.7	23.5	40.2
Sweden	361	7	22.0	13.8	19.9	21.6	23.8	36.5
Switzerland	289	2	21.3	13.8	19.5	21.1	22.7	36.3
Ukraine	11	0	18.9	15.2	16.5	19.0	20.2	22.1
United Kingdom	4564	99	22.6	13.5	20.0	22.1	24.5	47.0

[1] Belgium: most of the patients that have missing values are transplanted patients.

This table reports the median BMI (expressed as absolute values, not as z-scores), the mean BMI and other descriptive statistics for patients aged 18 years or older, by country.

Table 6.10 BMI: descriptive statistics by country. All male patients seen in 2013 aged 18 years or older.

Country	N	N Miss	Mean	Min	25th pctl (25% of the patients are below this BMI)	Median (50% of the patients are below this BMI)	75th pctl (75% of the patients are below this BMI)	Max
Austria	97	0	21.5	14.8	19.1	21.1	22.9	36.4
Belgium[1]	260	0	21.8	13.7	19.6	21.4	23.7	32.4
Czech Republic	96	17	21.1	15.4	18.8	20.5	22.9	34.2
Denmark	137	0	22.3	15.9	20.0	21.8	24.1	34.3
France	1566	15	21.1	13.3	19.0	20.8	22.8	42.4
Greece	16	0	21.2	15.8	17.5	21.7	23.4	32.0
Hungary	103	1	20.4	12.8	17.6	20.3	22.9	25.9
Ireland	249	13	22.4	15.7	20.4	22.2	24.2	32.0
Israel	153	0	23.2	15.4	20.4	22.9	25.3	38.4
Italy	1124	114	22.5	14.7	20.2	22.2	24.3	44.3
Latvia	2	0	20.0	19.6	19.6	20.0	20.3	20.3
Lithuania	7	1	20.7	18.0	20.2	20.8	21.9	22.3
Rep of Macedonia	12	0	21	18.6	19.7	21.1	22	23.5
Rep of Moldova	8	0	18.9	16.8	18.0	19.1	19.7	20.9
The Netherlands	400	0	22.1	15.6	20.2	21.8	23.7	32.1
Portugal	61	0	21.2	16.8	18.9	20.7	23.8	28.9
Russian Federation	265	3	19.7	12.7	17.5	19.1	21.3	35.9
Serbia	21	0	20.5	14.4	19.0	20.6	22.2	26.3
Slovak Republic	43	0	21.7	14.7	18.6	21.4	24.3	31.6
Slovenia	10	0	21.7	16.9	20.1	21.2	23.4	27.5
Spain	264	4	22.3	13.8	20.5	22.1	24.1	34.5
Sweden	193	3	22.8	14.7	20.5	22.5	24.5	36.5
Switzerland	162	2	21.5	13.8	19.6	21.5	22.8	36.3
Ukraine	7	0	18.8	15.2	16.5	19.2	20.2	22.1
United Kingdom	2491	49	23.0	13.6	20.5	22.7	25.0	47.0

[1] Belgium: most of the patients that have missing values are transplanted patients.

This table reports the median BMI (expressed as absolute values, not as z-scores), the mean BMI and other descriptive statistics for male patients aged 18 years or older, by country.

Table 6.11 BMI: descriptive statistics by country. All female patients seen in 2013 aged 18 years or older.

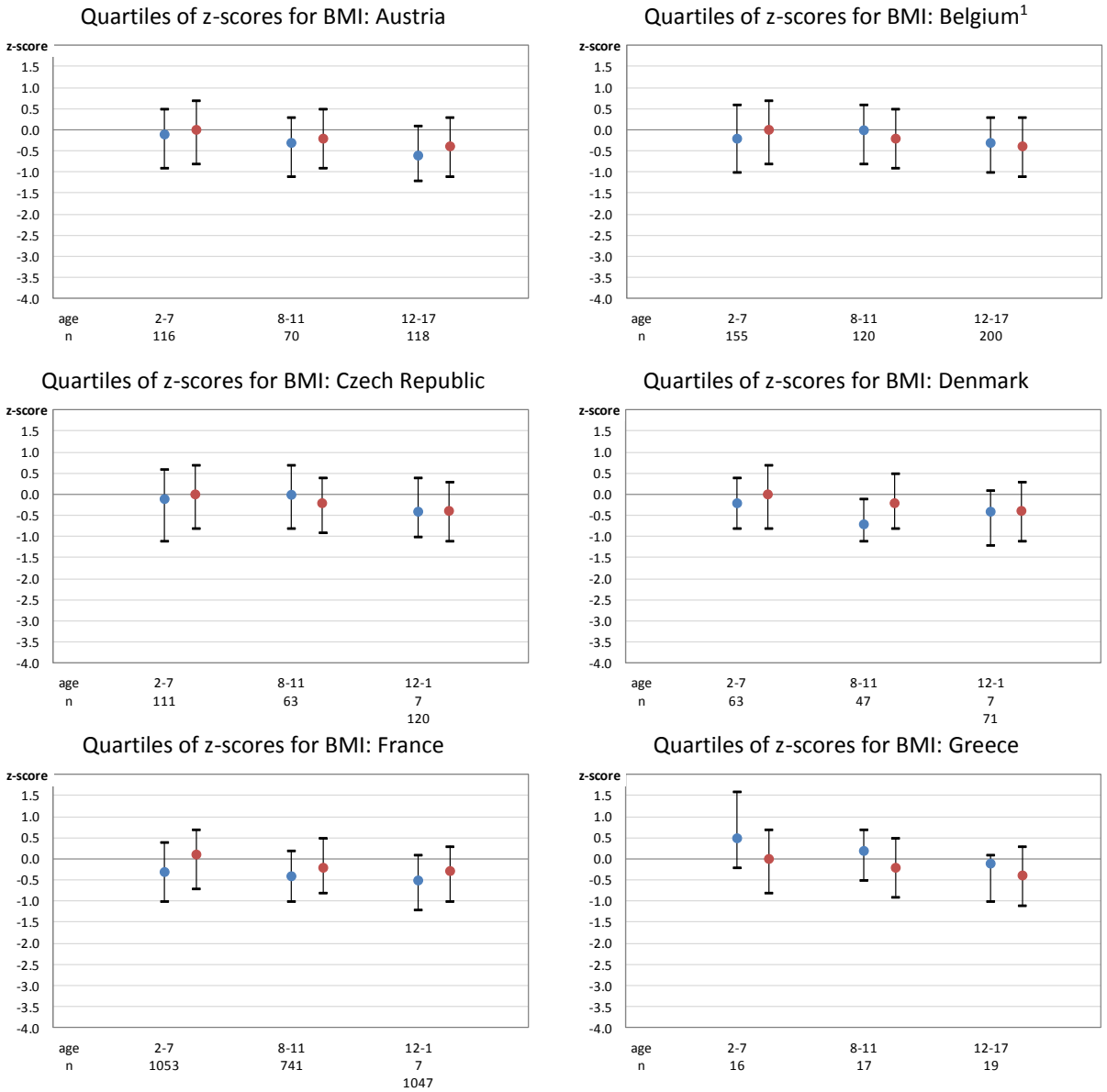
Country	N	N Miss	Mean	Min	25th pctl (25% of the patients are below this BMI)	Median (50% of the patients are below this BMI)	75th pctl (75% of the patients are below this BMI)	Max
Austria	93	0	20.1	14.8	18.3	19.6	21.2	30.9
Belgium[1]	240	0	21.4	16	19.4	20.8	22.8	35.6
Czech Republic	83	16	20.6	13.4	18.6	20.0	22.1	32.6
Denmark	122	0	20.7	13.1	18.6	20.4	22.2	36.1
France	1437	13	20.7	12.9	18.6	20.1	22.1	41.6
Greece	12	0	21.4	17.6	19.7	21.0	21.9	28.3
Hungary	64	1	19.0	14.3	16.6	19.1	21.2	28.0
Ireland	160	7	21.6	13.2	19.3	21.2	23.3	42.6
Israel	119	0	21.7	15.6	19.4	21.1	23.6	42.6
Italy	922	153	21.3	13.7	19.3	20.8	22.8	41.0
Latvia	2	0	16.7	16.1	16.1	16.7	17.4	17.4
Lithuania	5	0	19.2	16.2	17.7	17.8	19.0	25.0
Rep of Macedonia	9	0	20.4	17.3	19.2	20.4	21.6	22.7
Rep of Moldova	5	0	19.3	15.0	19.4	19.5	21.1	21.5
The Netherlands	311	0	21.7	15.7	19.4	21.2	23.2	39.0
Portugal	52	0	22.3	15.0	19.4	22.0	23.9	38.4
Russian Federation	190	6	18.8	13.2	17.1	18.4	20.5	34.6
Serbia	21	0	18.7	14.5	17.9	19.0	19.7	21.8
Slovak Republic	39	0	20.8	15.1	18.4	21.0	23.1	27.3
Slovenia	10	0	19.7	17.4	18.1	20.3	20.8	21.7
Spain	244	8	21.7	15.6	19.2	21.1	23	40.2
Sweden	168	4	21.2	13.8	19.3	20.7	22.6	34.3
Switzerland	127	0	20.9	14.5	19.1	20.3	22.0	35.2
Ukraine	4	0	18.9	16.5	17.7	18.9	20.2	21.3
United Kingdom	2073	50	22.2	13.5	19.6	21.5	23.8	46.1

1 Belgium: most of the patients that have missing values are transplanted patients.

This table reports the median BMI (expressed as absolute values, not as z-scores), the mean BMI and other descriptive statistics for female patients aged 18 years or older, by country.

Figure 6.6 Quartiles of z-scores for BMI by age group and country. Patients aged 2-17 years in 2013.

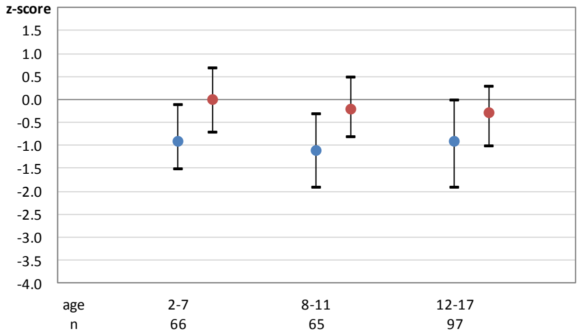
The figures below show the z-scores for weight by country. The dot is the median, and the whiskers show the 25th and 75th percentiles. In blue are the quartiles for the country, in red are the pooled quartiles computed on all other countries (i.e. excluding that country). We did not compute quartiles where the number of patients in the age group is <10. Therefore there are no blue dots for those age groups (the number of patients in each age group is shown underneath the horizontal axis). We therefore excluded Latvia, Lithuania and Romania from the graphs because none of the age groups in these countries had more than 10 patients.



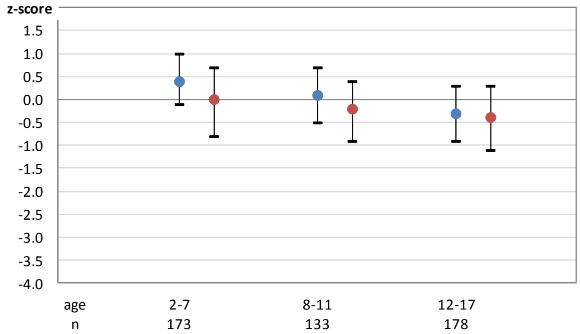
[1] Belgium: most of the patients that have missing values are transplanted patients.

[figure 6.6 continued]

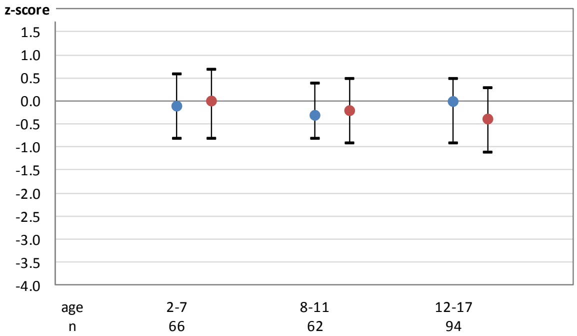
Quartiles of z-scores for BMI: Hungary



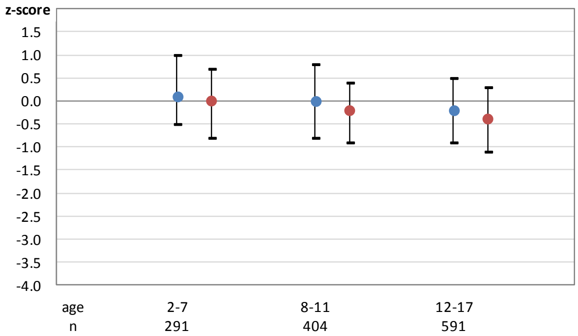
Quartiles of z-scores for BMI: Ireland



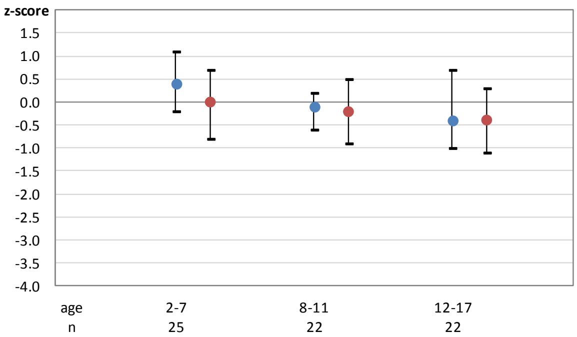
Quartiles of z-scores for BMI: Israel



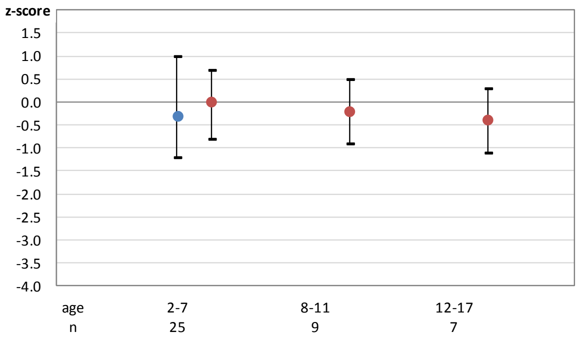
Quartiles of z-scores for BMI: Italy



Quartiles of z-scores for BMI: Rep of Macedonia

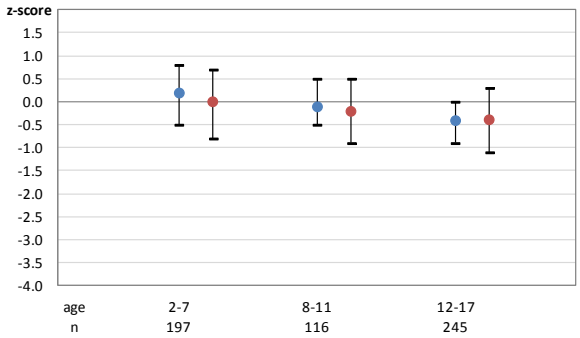


Quartiles of z-scores for BMI: Rep of Moldova

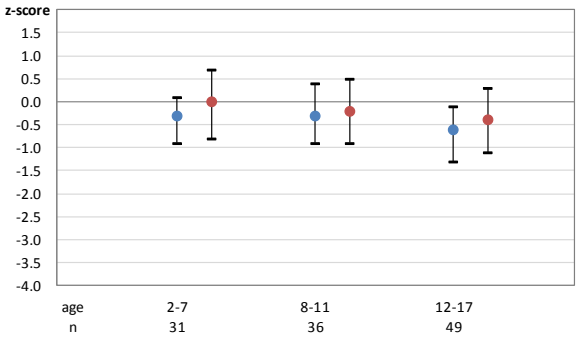


[figure 6.6 continued]

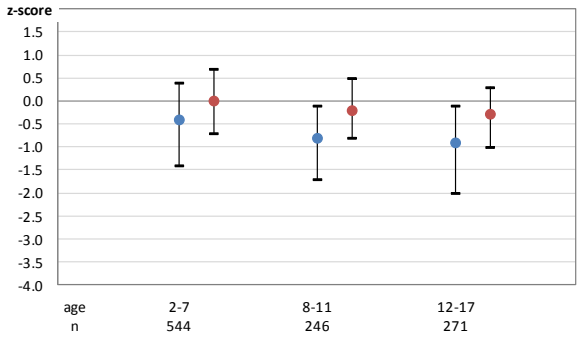
Quartiles of z-scores for BMI: The Netherlands



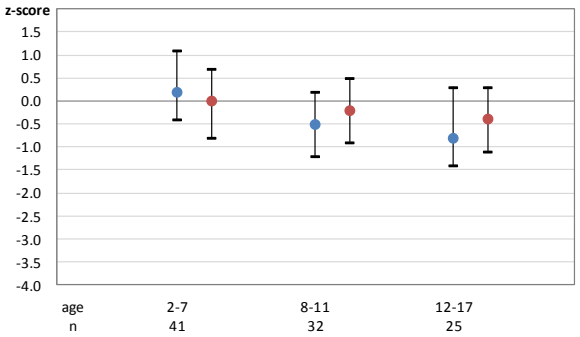
Quartiles of z-scores for BMI: Portugal



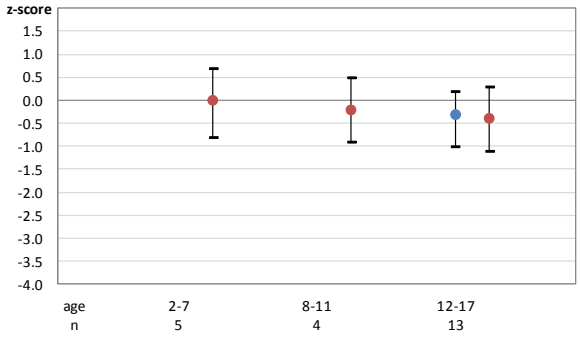
Quartiles of z-scores for BMI: Russian Federation



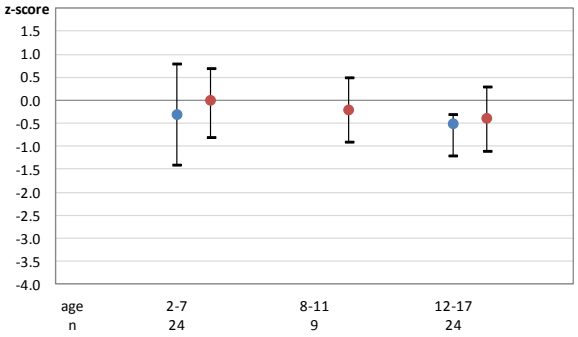
Quartiles of z-scores for BMI: Serbia



Quartiles of z-scores for BMI: Slovak Republic

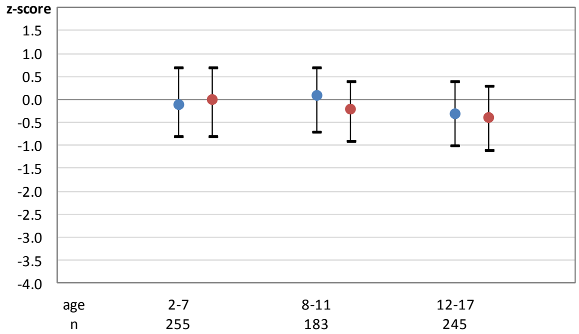


Quartiles of z-scores for BMI: Slovenia

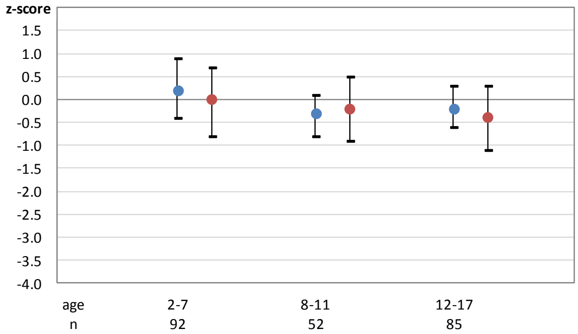


[figure 6.6 continued]

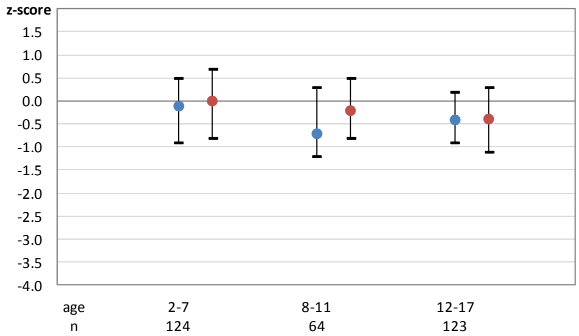
Quartiles of z-scores for BMI: Spain



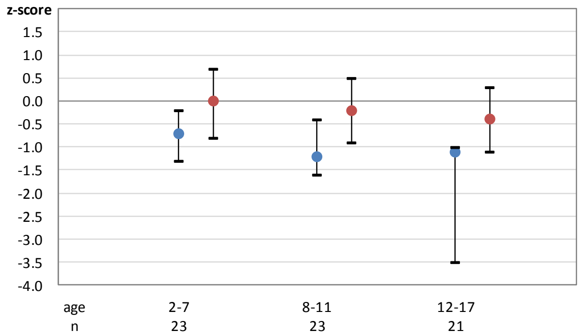
Quartiles of z-scores for BMI: Sweden



Quartiles of z-scores for BMI: Switzerland



Quartiles of z-scores for BMI: Ukraine



Quartiles of z-scores for BMI: United Kingdom

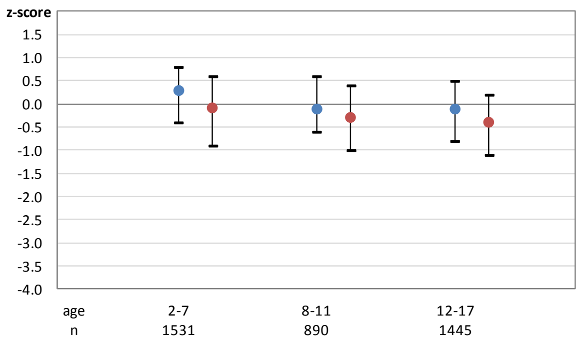
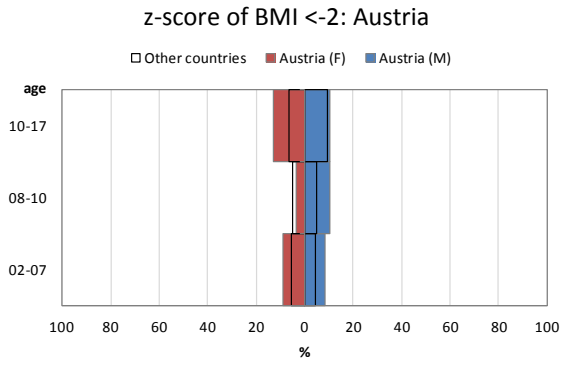
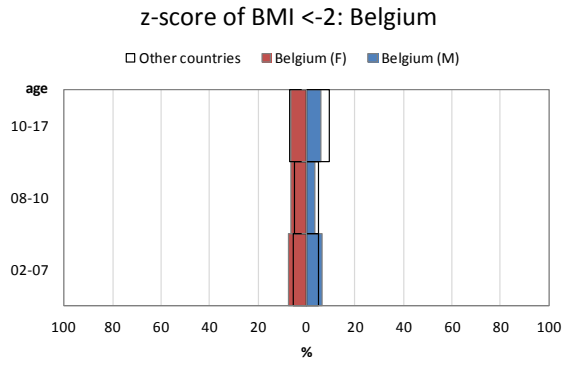
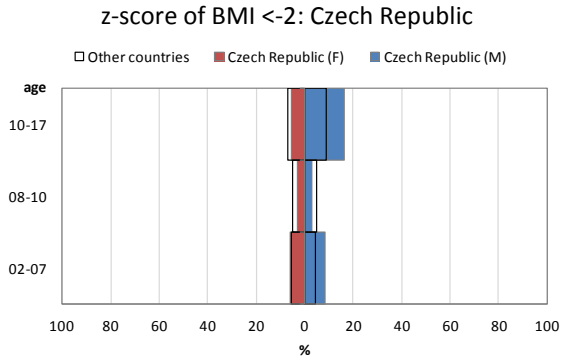


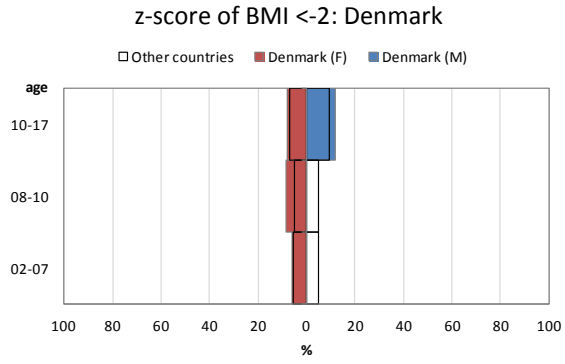
Figure 6.7 Proportion of child patients underweight (z-score of BMI<-2): age and sex pyramids, by country and overall. Patients aged 2-17 years in 2013.

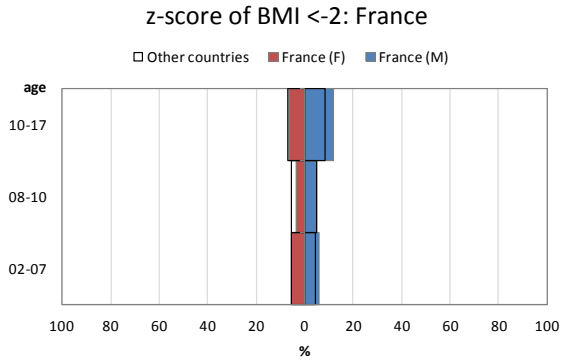
The coloured bars (red for females, blue for males) represent the percentage of underweight patients in the selected country, whereas the non-coloured bars represent the percentage of underweight patients in all the remaining countries (i.e. excluding that country). We excluded from the analyses those age groups where the number of patients was <10. We therefore excluded from the graphs Latvia, Lithuania, Republic of Moldova, Romania, Slovak Republic and Slovenia because some of the age groups in these countries had less than 10 patients.

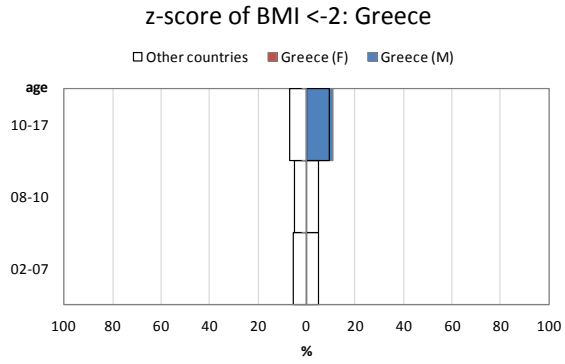




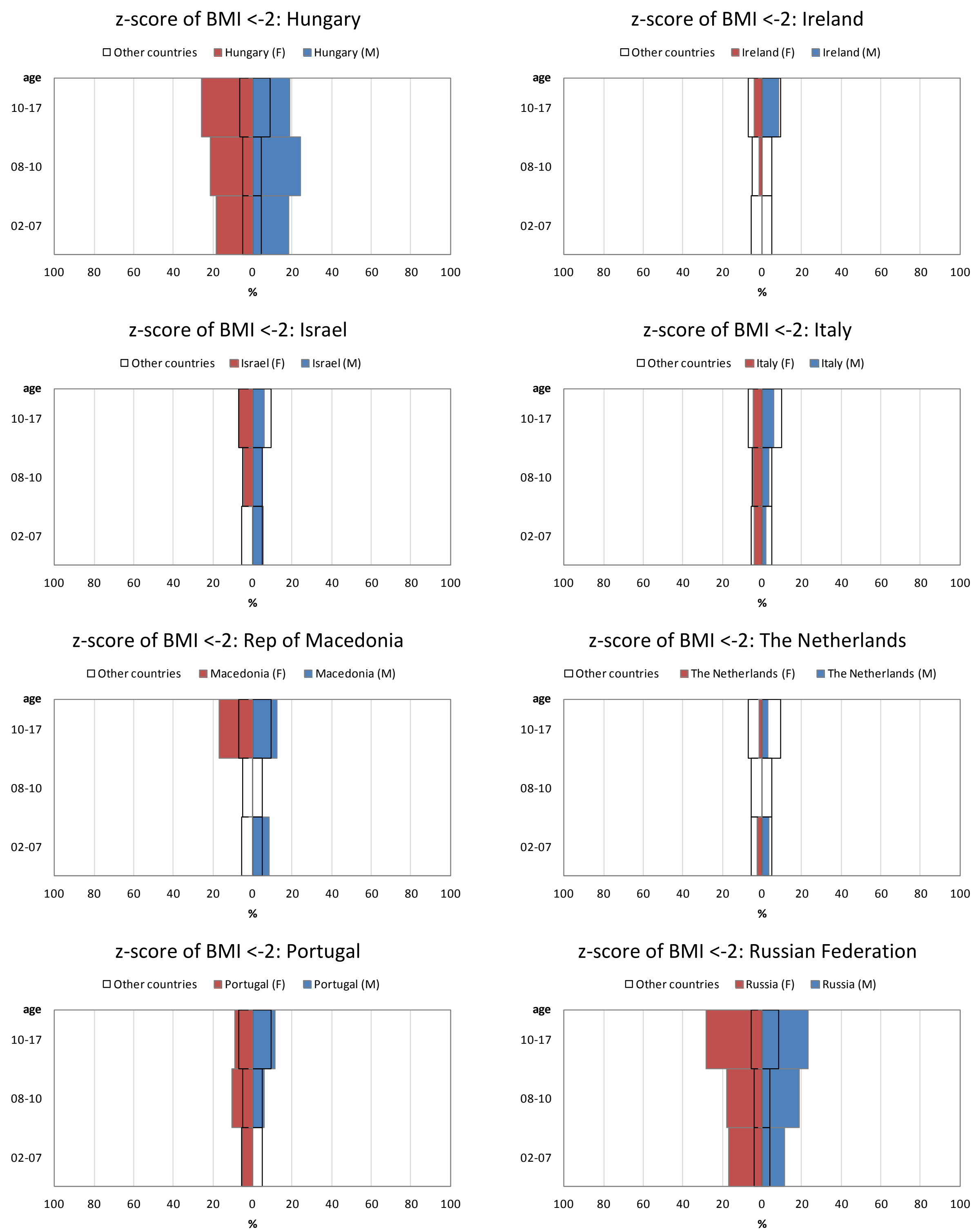






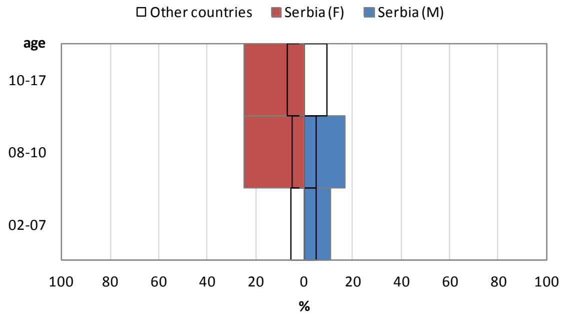


[figure 6.7 continued]

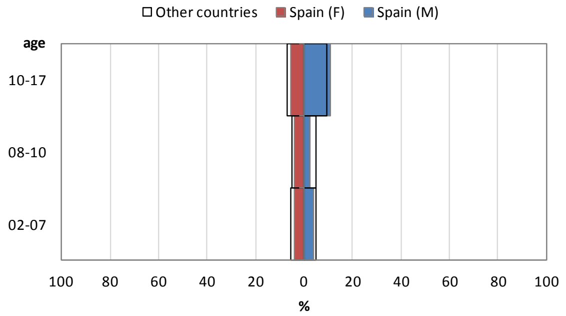


[figure 6.7 continued]

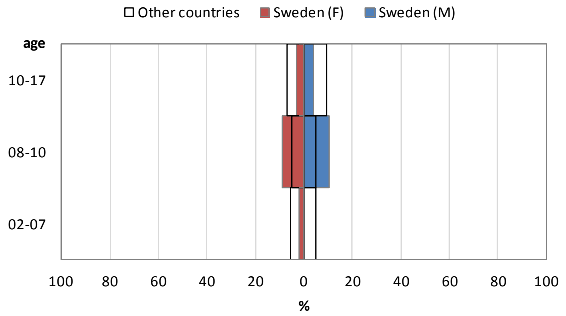
z-score of BMI <-2: Serbia



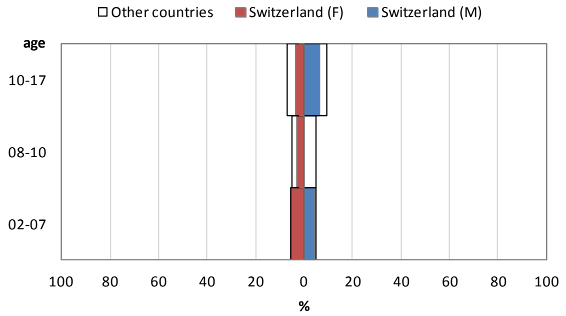
z-score of BMI <-2: Spain



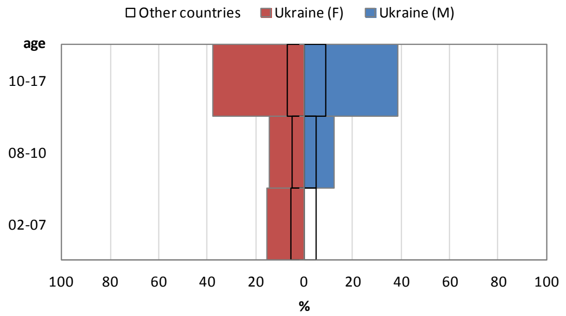
z-score of BMI <-2: Sweden



z-score of BMI <-2: Switzerland



z-score of BMI <-2: Ukraine



z-score of BMI <-2: United Kingdom

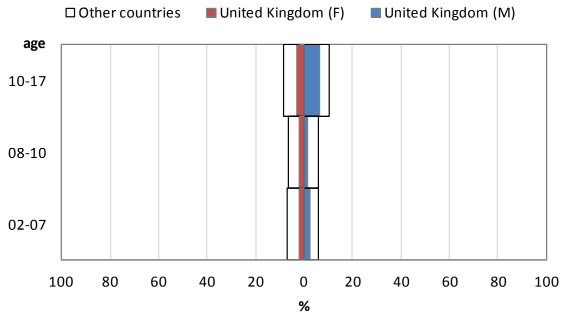
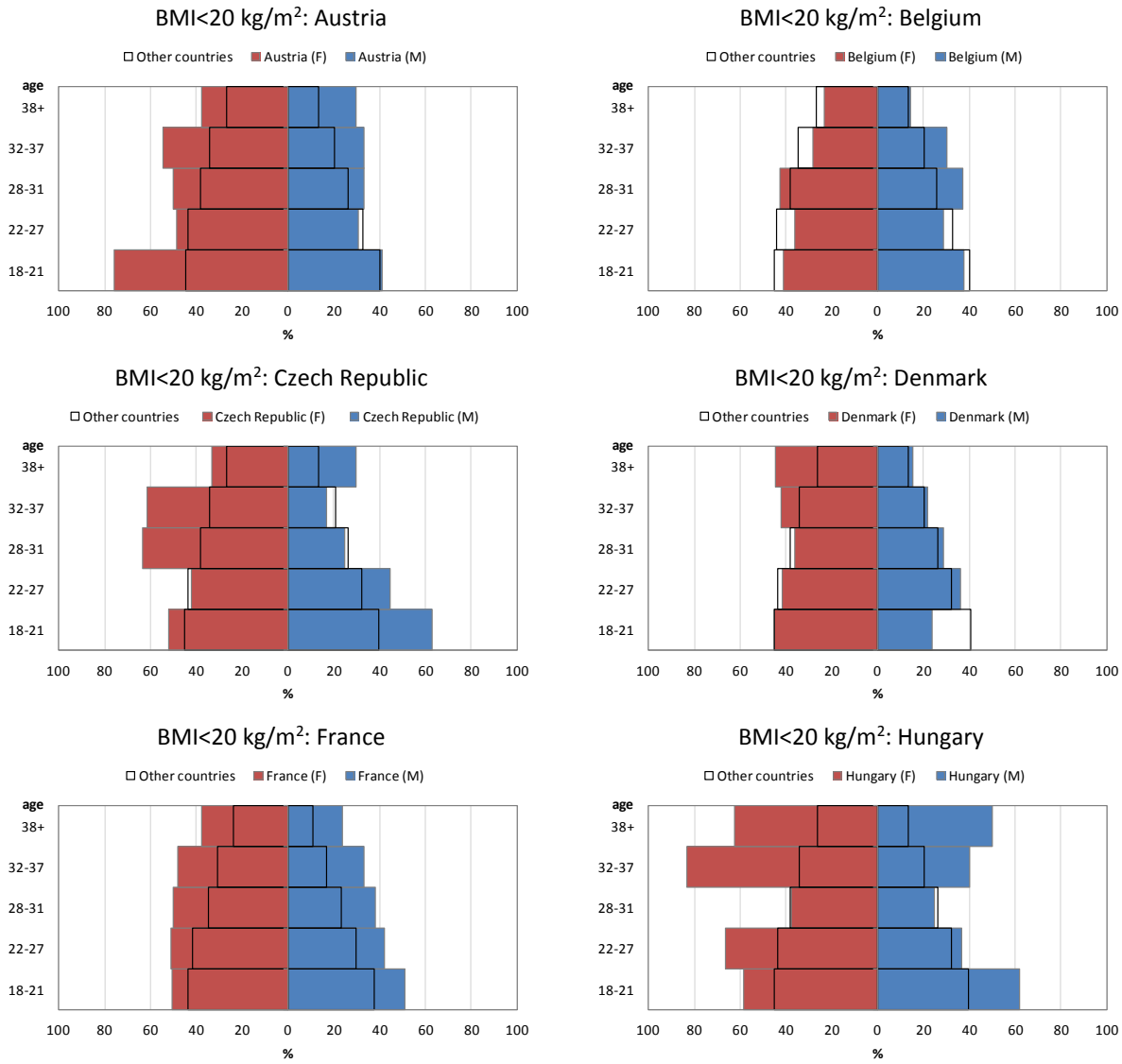


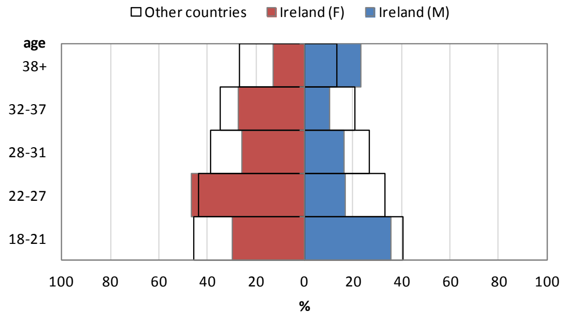
Figure 6.8 Proportion of adult patients with BMI<20: age and sex pyramids, by country and overall. Patients aged 18 years or older in 2013.

The coloured bars (red for females, blue for males) represent the percentage of underweight patients in the selected country, whereas the non-coloured bars represent the percentage of underweight patients in all the remaining countries (i.e. excluding that country). We excluded from the analyses those age groups where the number of patients was <10. We therefore excluded from the graphs Greece, Latvia, Lithuania, Republic of Moldova, Republic of Macedonia, Portugal, Romania, Serbia, Slovak Republic, Slovenia and Ukraine because some of the age groups in these countries had less than 10 patients.

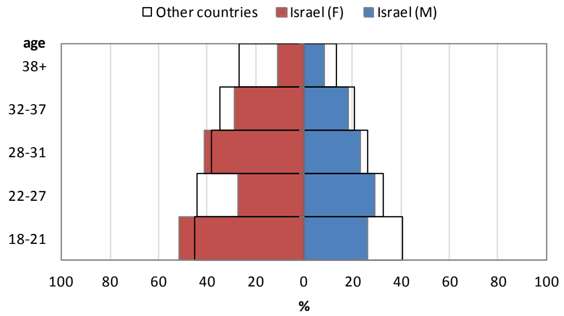


[figure 6.8 continued]

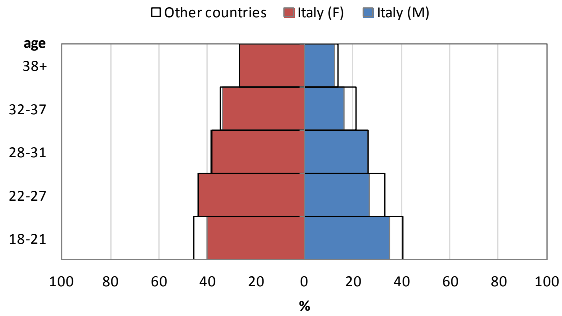
BMI<20 kg/m^2: Ireland



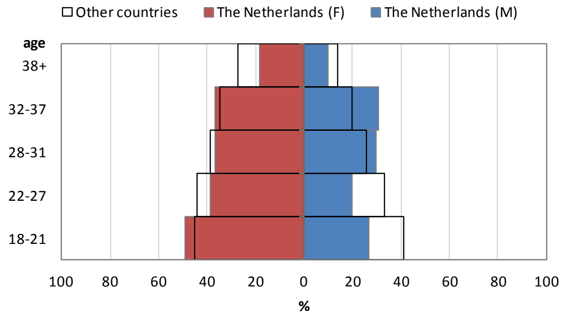
BMI<20 kg/m^2: Israel



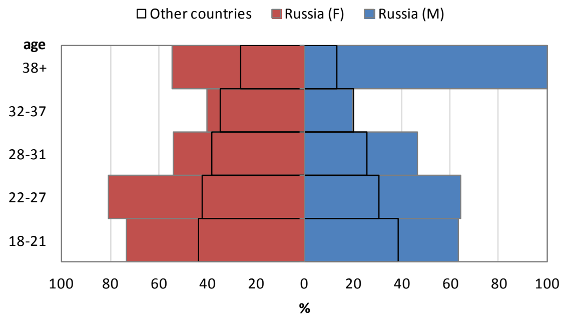
BMI<20 kg/m^2: Italy



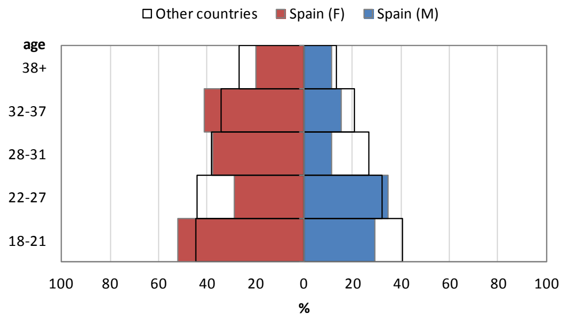
BMI<20 kg/m^2: The Netherlands



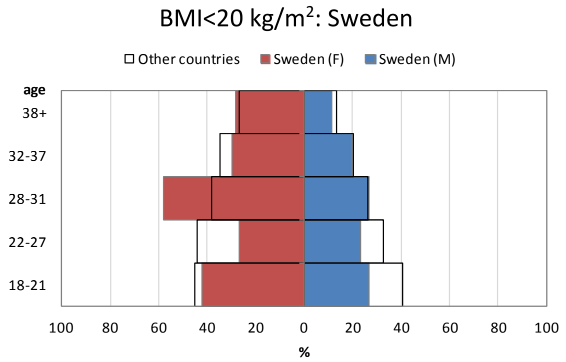
BMI<20 kg/m^2: Russian Federation

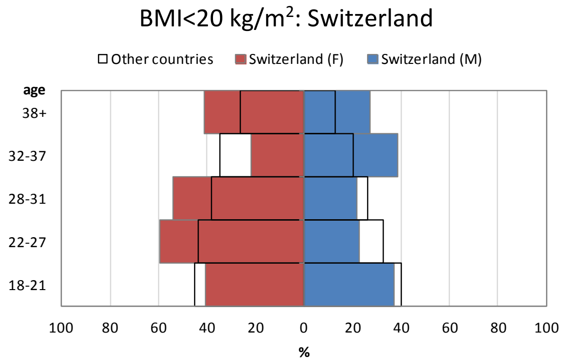


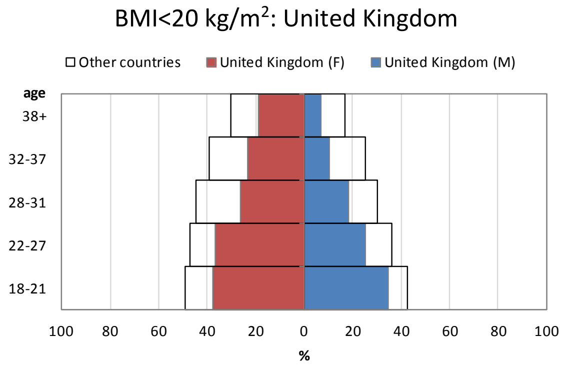
BMI<20 kg/m^2: Spain



[figure 6.8 continued]







7. Complications and therapy

The information in this section should not be considered complete, either because national registries do not collect data about one or more complications, because they use a different definition, or because the status of the complication is truly unknown (e.g. liver disease, where the definition requires ultrasound examination). In the tables, therefore, we show the number of missing values for the various complications, but in the graphs we have included only countries where less than 10% of the data were missing. For a full list of complications and definitions please see Appendix 2 on page 120.

In this section we also present data on selected therapies. We collected information on therapies using the generic name of the drug (i.e. not the brand name), in order to avoid data collection bias due to brand names. For example, we ask whether the patient has been taking ”inhaled antibiotics for more than three months this year”, instead of naming individual antibiotics.

Like the complications section, the information presented in the therapy section should not be considered complete, and we will show only selected results, in accordance with the same criteria used for complications.

Table 7.1 Prevalence of allergic bronchopulmonary aspergillosis (all patients seen in 2013) and CFRD treated with insulin in 2013 (patients aged 18 years or older), by country.

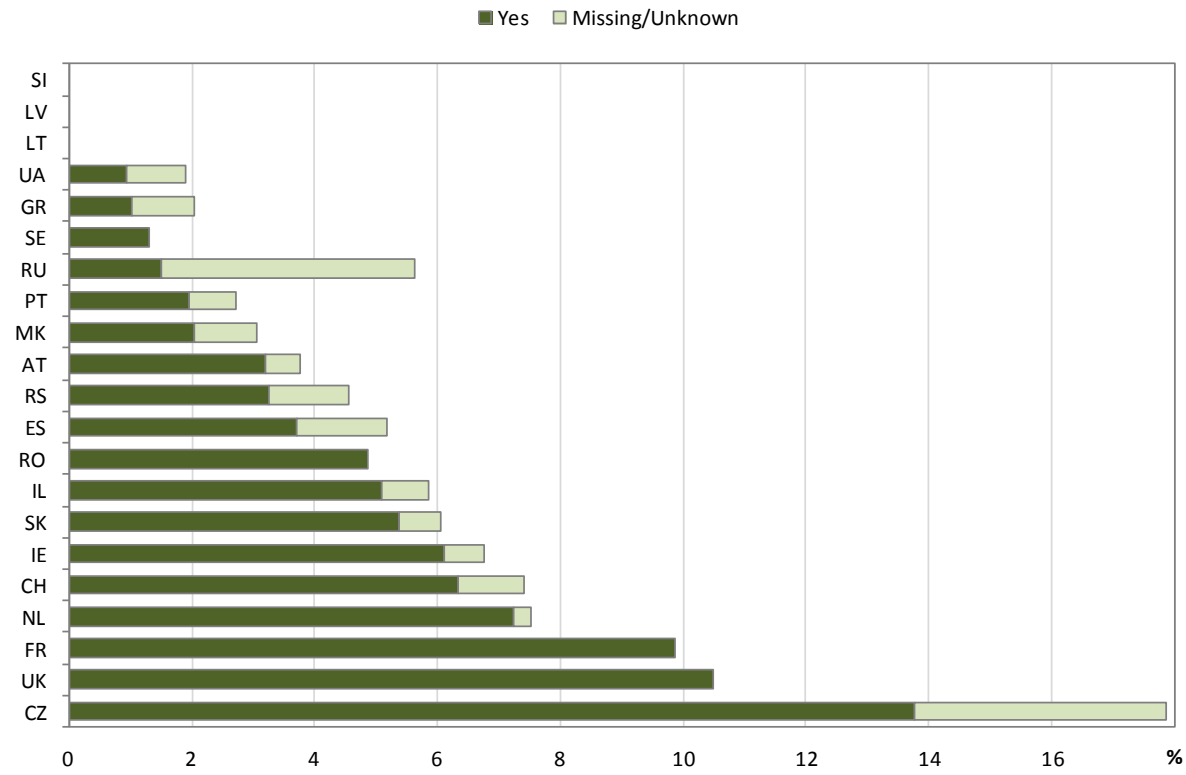
Country	ABPA this year number (%)			CF related diabetes with daily use of insulin this year number (%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Austria	3 (0.56)	512 (96.24)	17 (3.20)	0 (0)	159 (77.94)	45 (22.06)
Belgium[1]	136 (11.80)	957 (83.00)	60 (5.20)	130 (20.03)	415 (63.94)	104 (16.02)
Czech Republic	24 (4.08)	483 (82.14)	81 (13.78)	13 (5.12)	157 (61.81)	84 (33.07)
Denmark	466 (100)	-	-	0 (0)	165 (59.14)	114 (40.86)
France[2]	0 (0)	5665 (90.12)	621 (9.88)	0 (0)	2417 (75.82)	771 (24.18)
Greece	1 (1.02)	96 (97.96)	1 (1.02)	0 (0)	30 (88.24)	4 (11.76)
Hungary	86 (17.00)	418 (82.61)	2 (0.40)	56 (23.33)	141 (58.75)	43 (17.92)
Ireland	7 (0.66)	991 (93.23)	65 (6.11)	6 (1.19)	364 (72.37)	133 (26.44)
Israel	4 (0.76)	498 (94.14)	27 (5.10)	4 (1.39)	201 (69.79)	83 (28.82)
Italy	1785 (37.41)	2855 (59.84)	131 (2.75)	367 (14.15)	1696 (65.38)	531 (20.47)
Latvia	0 (0)	35 (100)	0 (0)	0 (0)	6 (66.67)	3 (33.33)
Lithuania	0 (0)	13 (100)	0 (0)	0 (0)	11 (84.62)	2 (15.38)
Rep of Macedonia	1 (1.02)	95 (96.94)	2 (2.04)	0 (0)	16 (72.73)	6 (27.27)
Rep of Moldova	53 (86.89)	7 (11.48)	1 (1.64)	0 (0)	12 (92.31)	1 (7.69)
The Netherlands	4 (0.30)	1240 (92.47)	97 (7.23)	5 (0.68)	448 (61.12)	280 (38.20)
Portugal	2 (0.78)	249 (97.27)	5 (1.95)	1 (0.81)	107 (86.99)	15 (12.20)
Romania	0 (0)	39 (95.12)	2 (4.88)	0 (0)	1 (100)	0 (0)
Russian Federation	79 (4.11)	1814 (94.38)	29 (1.51)	25 (4.51)	483 (87.18)	46 (8.30)
Serbia	2 (1.30)	147 (95.45)	5 (3.25)	1 (2.27)	33 (75.00)	10 (22.73)
Slovak Republic	1 (0.67)	140 (93.96)	8 (5.37)	1 (1.16)	77 (89.53)	8 (9.30)
Slovenia	0 (0)	81 (100)	0 (0)	0 (0)	19 (86.36)	3 (13.64)
Spain	20 (1.46)	1303 (94.83)	51 (3.71)	10 (1.76)	392 (69.14)	165 (29.10)
Sweden	0 (0)	606 (98.70)	8 (1.30)	0 (0)	283 (74.28)	98 (25.72)
Switzerland	7 (1.06)	613 (92.60)	42 (6.34)	2 (0.65)	234 (76.47)	70 (22.88)
Ukraine	1 (0.95)	103 (98.10)	1 (0.95)	0 (0)	11 (100)	0 (0)
United Kingdom	0 (0)	8102 (89.52)	948 (10.48)	5 (0.10)	3289 (68.54)	1505 (31.36)

[2] Belgium: most of the patients that have missing values are transplanted patients.

[1] France: ABPA was collected as: Aspergillosis (ABPA and other) if treated.

This table shows the frequency of allergic bronchopulmonary aspergillosis (see Appendix 2, page 120, for ABPA definitions) and CF-related diabetes (CFRD) – defined here as treated daily with insulin – by country. For CFRD only patients 18 years or older are included.

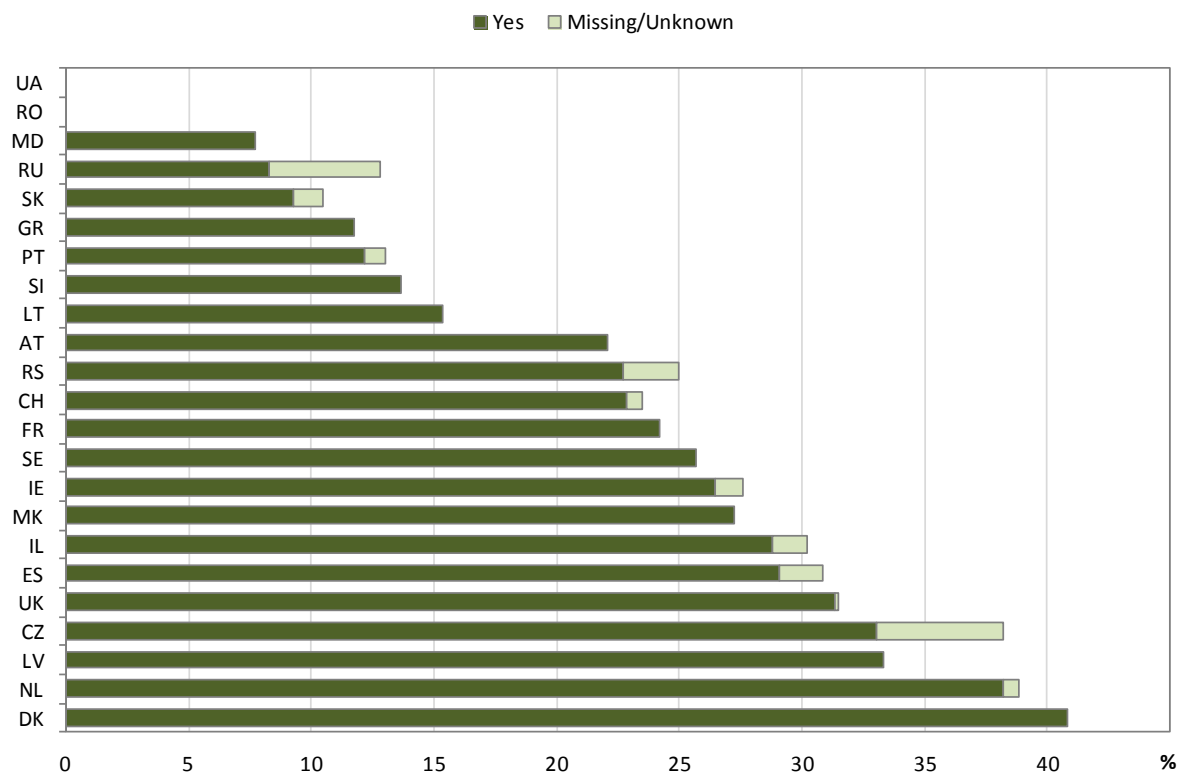
Figure 7.1 Prevalence of allergic bronchopulmonary aspergillosis in all patients seen in 2013, by country.



Note: We excluded from the graph the countries for which the information on allergic bronchopulmonary aspergillosis (ABPA) was missing for more than 10% of the patients.
Note: Belgium: most of the patients that have missing values are transplanted patients.
France collected ABPA as Aspergillosis (ABPA and other) if treated.

This graph shows the frequency of allergic bronchopulmonary aspergillosis by country. For the definition of ABPA see Appendix 2, page 120. The dark green part of the bar shows the percentage of patients with ABPA, the light green part shows the percentage of patients for which this information was missing.

Figure 7.2 Prevalence of CFRD requiring daily insulin treatment, by country. All patients seen in 2013 aged 18 years or older.



Note: We excluded from the graph the countries for which the information on CFRD was missing for more than 10% of the patients.
Note: For Belgium most of the patients that have missing values are transplanted patients.

This graph shows the prevalence of CF-related diabetes (CFRD) by country. CFRD is recorded differently among the national registries. As a substitute marker of diabetes, we have collected data on the use of insulin on a daily basis. The dark green part of the bar shows the percentage of patients who use insulin daily, the light green part shows the percentage of patients for whom this information was missing. Only patients aged 18 years or older were included in this graph.

Table 7.2 Prevalence of pneumothorax, haemoptysis and malignancy in all patients seen in 2013, by country.

Country	Pneumothorax requiring chest tube this year number (%)			Haemoptysis major over 250 ml this year number (%)			Malignancy occurred this year number(%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Austria	2 (0.38)	526 (98.87)	4 (0.75)	6 (1.13)	516 (96.99)	10 (1.88)	2 (0.38)	530 (99.62)	0 (0)
Belgium[1]	136 (11.80)	1015 (88.03)	2 (0.17)	136 (11.80)	1006 (87.25)	11 (0.95)	136 (11.80)	1014 (87.94)	3 (0.26)
Czech Republic	30 (5.10)	548 (93.20)	10 (1.70)	29 (4.93)	543 (92.35)	16 (2.72)	24 (4.08)	564 (95.92)	0 (0)
Denmark	466 (100)	-	-	466 (100)	-	-	0 (0)	466 (100)	0 (0)
France[2]	0 (0)	6235 (99.19)	51 (0.81)	0 (0)	6012 (95.64)	274 (4.36)	0 (0)	6249 (99.41)	37 (0.59)
Greece	0 (0)	98 (100)	0 (0)	0 (0)	98 (100)	0 (0)	0 (0)	98 (100)	0 (0)
Hungary	80 (15.81)	421 (83.20)	5 (0.99)	88 (17.39)	414 (81.82)	4 (0.79)	87 (17.19)	416 (82.21)	3 (0.59)
Ireland	7 (0.66)	1049 (98.68)	7 (0.66)	7 (0.66)	1055 (99.25)	1 (0.09)	7 (0.66)	1053 (99.06)	3 (0.28)
Israel	5 (0.95)	524 (99.05)	0 (0)	6 (1.13)	517 (97.73)	6 (1.13)	6 (1.13)	523 (98.87)	0 (0)
Italy	1015 (21.27)	3737 (78.33)	19 (0.40)	1018 (21.34)	3716 (77.89)	37 (0.78)	1015 (21.27)	3737 (78.33)	19 (0.40)
Latvia	0 (0)	35 (100)	0 (0)	0 (0)	35 (100)	0 (0)	0 (0)	35 (100)	0 (0)
Lithuania	0 (0)	13 (100)	0 (0)	0 (0)	12 (92.31)	1 (7.69)	0 (0)	13 (100)	0 (0)
Rep of Macedonia	1 (1.02)	97 (98.98)	0 (0)	1 (1.02)	97 (98.98)	0 (0)	1 (1.02)	97 (98.98)	0 (0)
Rep of Moldova	0 (0)	61 (100)	0 (0)	0 (0)	52 (85.25)	9 (14.75)	0 (0)	61 (100)	0 (0)
The Netherlands[3]	3 (0.22)	1327 (98.96)	11 (0.82)	7 (0.52)	1265 (94.33)	69 (5.15)	13 (0.97)	1316 (98.14)	12 (0.89)
Portugal	1 (0.39)	255 (99.61)	0 (0)	2 (0.78)	239 (93.36)	15 (5.86)	1 (0.39)	255 (99.61)	0 (0)
Romania	0 (0)	41 (100)	0 (0)	0 (0)	40 (97.56)	1 (2.44)	0 (0)	41 (100)	0 (0)
Russian Federation	56 (2.91)	1854 (96.46)	12 (0.62)	58 (3.02)	1830 (95.21)	34 (1.77)	52 (2.71)	1866 (97.09)	4 (0.21)
Serbia	2 (1.30)	152 (98.70)	0 (0)	1 (0.65)	152 (98.70)	1 (0.65)	0 (0)	154 (100)	0 (0)
Slovak Republic	4 (2.68)	145 (97.32)	0 (0)	1 (0.67)	134 (89.93)	14 (9.40)	1 (0.67)	148 (99.33)	0 (0)
Slovenia	1 (1.23)	79 (97.53)	1 (1.23)	0 (0)	80 (98.77)	1 (1.23)	0 (0)	81 (100)	0 (0)
Spain	24 (1.75)	1345 (97.89)	5 (0.36)	24 (1.75)	1287 (93.67)	63 (4.59)	25 (1.82)	1340 (97.53)	9 (0.66)
Sweden	0 (0)	612 (99.67)	2 (0.33)	0 (0)	614 (100)	0 (0)	0 (0)	613 (99.84)	1 (0.16)
Switzerland	7 (1.06)	652 (98.49)	3 (0.45)	7 (1.06)	634 (95.77)	21 (3.17)	8 (1.21)	654 (98.79)	0 (0)
Ukraine	1 (0.95)	104 (99.05)	0 (0)	0 (0)	102 (97.14)	3 (2.86)	1 (0.95)	104 (99.05)	0 (0)
United Kingdom	0 (0)	8997 (99.41)	53 (0.59)	0 (0)	8984 (99.27)	66 (0.73)	0 (0)	9022 (99.69)	28 (0.31)

[1] Belgium: most of the patients that have missing values are transplanted patients.

[2] France: pneumothorax only; haemoptysis, no quantification.

[3] The Netherlands: malignancy diagnosed this year/before.

The table shows the frequency of three rare complications: Pneumothorax (collapsed lung) requiring chest tube, haemoptysis (coughing up of blood) of more than 250 ml and occurrence of malignancy (cancer). All these complications are extremely rare.

Table 7.3 Prevalence of liver disease and use of ursodeoxycholic acid in all patients seen in 2013, by country.

Country	Liver disease this year number (%)						Ursodeoxycholic acid this year number (%)		
	Missing/ unknown	No liver disease	Cirrhosis			Liver disease without cirrhosis	Missing/ unknown	No	Yes
			Cirrhosis with portal hypertension/ hypersplenism	Cirrhosis no portal hypertension/ hypersplenism	Cirrhosis, portal hypertension unknown				
Austria	6 (1.13)	287 (53.95)	21 (3.95)	15 (2.82)	2 (0.38)	201 (37.78)	2 (0.38)	269 (50.56)	261 (49.06)
Belgium[1]	136 (11.80)	973 (84.39)	44 (3.82)	0 (0)	0 (0)	0 (0)	139 (12.06)	765 (66.35)	249 (21.60)
Czech Republic	185 (31.46)	253 (43.03)	6 (1.02)	5 (0.85)	0 (0)	139 (23.64)	24 (4.08)	341 (57.99)	223 (37.93)
Denmark	0 (0)	435 (93.35)	10 (2.15)	0 (0)	6 (1.29)	15 (3.22)	0 (0)	366 (78.54)	100 (21.46)
France[2]	0 (0)	6024 (95.83)	0 (0)	0 (0)	262 (4.17)	0 (0)	0 (0)	4244 (67.52)	2042 (32.48)
Greece	1 (1.02)	58 (59.18)	34 (34.69)	0 (0)	1 (1.02)	4 (4.08)	0 (0)	56 (57.14)	42 (42.86)
Hungary	85 (16.80)	288 (56.92)	47 (9.29)	11 (2.17)	4 (0.79)	71 (14.03)	106 (20.95)	240 (47.43)	160 (31.62)
Ireland	7 (0.66)	964 (90.69)	30 (2.82)	0 (0)	1 (0.09)	61 (5.74)	12 (1.13)	926 (87.11)	125 (11.76)
Israel	5 (0.95)	432 (81.66)	8 (1.51)	4 (0.76)	0 (0)	80 (15.12)	7 (1.32)	430 (81.29)	92 (17.39)
Italy	1017 (21.32)	2904 (60.87)	47 (0.99)	22 (0.46)	8 (0.17)	773 (16.20)	1018 (21.34)	2479 (51.96)	1274 (26.70)
Latvia	0 (0)	13 (37.14)	1 (2.86)	0 (0)	0 (0)	21 (60.00)	0 (0)	14 (40.00)	21 (60.00)
Lithuania	0 (0)	13 (100)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	13 (100)	0 (0)
Rep of Macedonia	1 (1.02)	44 (44.90)	3 (3.06)	17 (17.35)	0 (0)	33 (33.67)	1 (1.02)	44 (44.90)	53 (54.08)
Rep of Moldova	0 (0)	60 (98.36)	1 (1.64)	0 (0)	0 (0)	0 (0)	0 (0)	4 (6.56)	57 (93.44)
The Netherlands	30 (2.24)	1043 (77.78)	70 (5.22)	20 (1.49)	167 (12.45)	11 (0.82)	3 (0.22)	965 (71.96)	373 (27.82)
Portugal	3 (1.17)	203 (79.30)	1 (0.39)	2 (0.78)	0 (0)	47 (18.36)	15 (5.86)	160 (62.50)	81 (31.64)
Romania	0 (0)	37 (90.24)	0 (0)	0 (0)	0 (0)	4 (9.76)	0 (0)	40 (97.56)	1 (2.44)

[1] Belgium: collects only cirrhosis with portal hypertension yes or no. No liver disease therefore means no cirrhosis with portal hypertension. For Belgium most of the patients that have missing values are transplanted patients.

[2] France: collects cirrhosis/liver disease yes or no – these have been pooled under cirrhosis, portal hypertension unknown.

[table 7.3 continued]

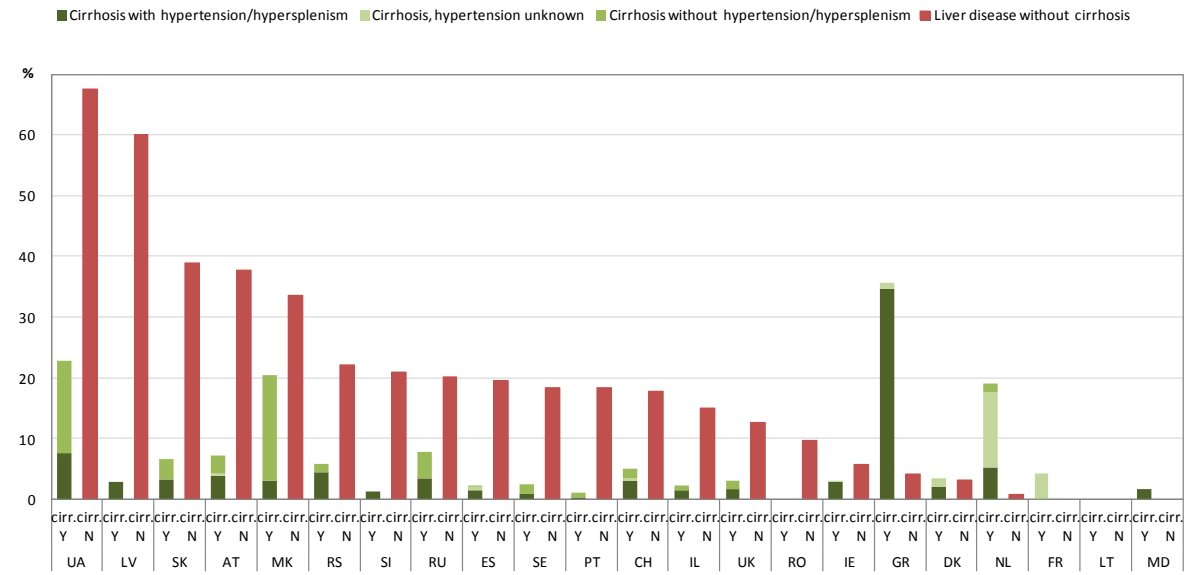
Country	Liver disease this year number (%)						Ursodeoxycholic acid this year number (%)		
	Missing/ unknown	No liver disease	Cirrhosis			Liver disease without cirrhosis	Missing/ unknown	No	Yes
			Cirrhosis with portal hypertension/ hypersplenism	Cirrhosis no portal hypertension/ hypersplenism	Cirrhosis, portal hypertension unknown				
Russian Federation	70 (3.64)	1315 (68.42)	65 (3.38)	81 (4.21)	3 (0.16)	388 (20.19)	45 (2.34)	141 (7.34)	1736 (90.32)
Serbia[3]	3 (1.95)	108 (70.13)	7 (4.55)	2 (1.30)	0 (0)	34 (22.08)	1 (0.65)	110 (71.43)	43 (27.92)
Slovak Republic	2 (1.34)	79 (53.02)	5 (3.36)	5 (3.36)	0 (0)	58 (38.93)	2 (1.34)	69 (46.31)	78 (52.35)
Slovenia	0 (0)	63 (77.78)	1 (1.23)	0 (0)	0 (0)	17 (20.99)	0 (0)	26 (32.10)	55 (67.90)
Spain	20 (1.46)	1052 (76.56)	20 (1.46)	3 (0.22)	9 (0.66)	270 (19.65)	28 (2.04)	1012 (73.65)	334 (24.31)
Sweden[4]	0 (0)	486 (79.15)	6 (0.98)	9 (1.47)	0 (0)	113 (18.40)	21 (3.42)	455 (74.10)	138 (22.48)
Switzerland	35 (5.29)	476 (71.90)	21 (3.17)	10 (1.51)	2 (0.30)	118 (17.82)	4 (0.60)	484 (73.11)	174 (26.28)
Ukraine	2 (1.90)	8 (7.62)	8 (7.62)	16 (15.24)	0 (0)	71 (67.62)	2 (1.90)	5 (4.76)	98 (93.33)
United Kingdom	0 (0)	7619 (84.19)	156 (1.72)	125 (1.38)	4 (0.04)	1146 (12.66)	195 (2.15)	6968 (76.99)	1887 (20.85)

[3] Serbia: cirrhosis without portal hypertension/hypersplenism means the presence of CF-related liver disease with normal liver function.

[4] Sweden: has only collected cirrhosis with portal hypertension yes or no this year. The rest have been set to No liver disease due to software issues. The prevalence of use of ursodeoxycholic acid could be used as an indicator of the total prevalence of liver disease of all categories.

This table shows the frequency and severity of liver disease according to the ECFSPR definitions (see Appendix 2, page 120) and use of ursodeoxycholic acid, a commonly used treatment for CF liver disease. The frequency and severity of liver disease differs greatly, and does not correspond to the number of patients on ursodeoxycholic acid.

Figure 7.3 Prevalence and severity of liver disease in all patients seen in 2013, by country.



Note: We excluded from the graph the countries for which the information on liver disease was missing for more than 10% of the patients.

Note: Belgium: collects only cirrhosis with portal hypertension yes or no. No liver disease therefore means no cirrhosis with portal hypertension. For Belgium most of the patients that have missing values are transplanted patients.

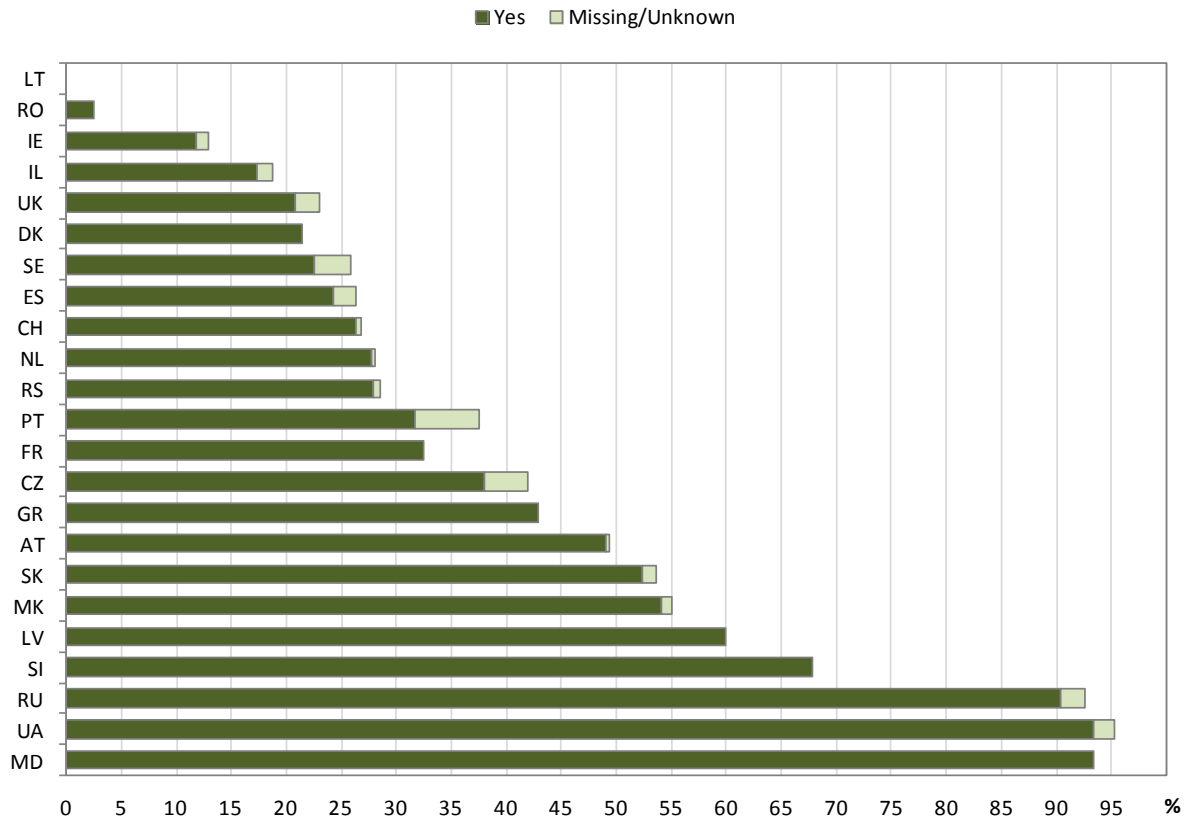
France: collects cirrhosis/liver disease yes or no – these have been pooled under cirrhosis, portal hypertension unknown.

Serbia: cirrhosis without portal hypertension/hypersplenism means the presence of CF-related disease with normal liver function.

Sweden: has only collected cirrhosis with portal hypertension yes or no this year. The rest have been set to No liver disease due to software issues. The prevalence of use of ursodeoxycholic acid could be used as an indicator of the total amount of liver disease of all categories.

This graph shows the frequency of liver disease by country. Liver disease is defined according to severity of portal hypertension (increased blood pressure in the liver veins, often resulting in blood shunting past the cirrhotic liver), divided into five categories, including no liver disease (see Appendix 2). This graph emphasises better than the table the vast differences in frequency and severity, which may be due to problems in definitions and diagnostic tools.

Figure 7.4 Use of ursodeoxycholic acid in all patients seen in 2013, by country.



Note: We excluded from the graph the countries for which the information on ursodeoxycholic acid was missing for more than 10% of the patients.

Note: For Belgium most of the patients that have missing values are transplanted patients.

This graph shows how many patients used ursodeoxycholic acid during the survey year. Ursodeoxycholic acid is used as a treatment for CF liver disease. The dark green part of the bar indicates the percentage of patients taking this drug, the light green part shows the percentage of patients for whom this information is missing.

Table 7.4 Use of hypertonic saline, rhDNase and bronchodilators in all patients seen in 2013, by country.

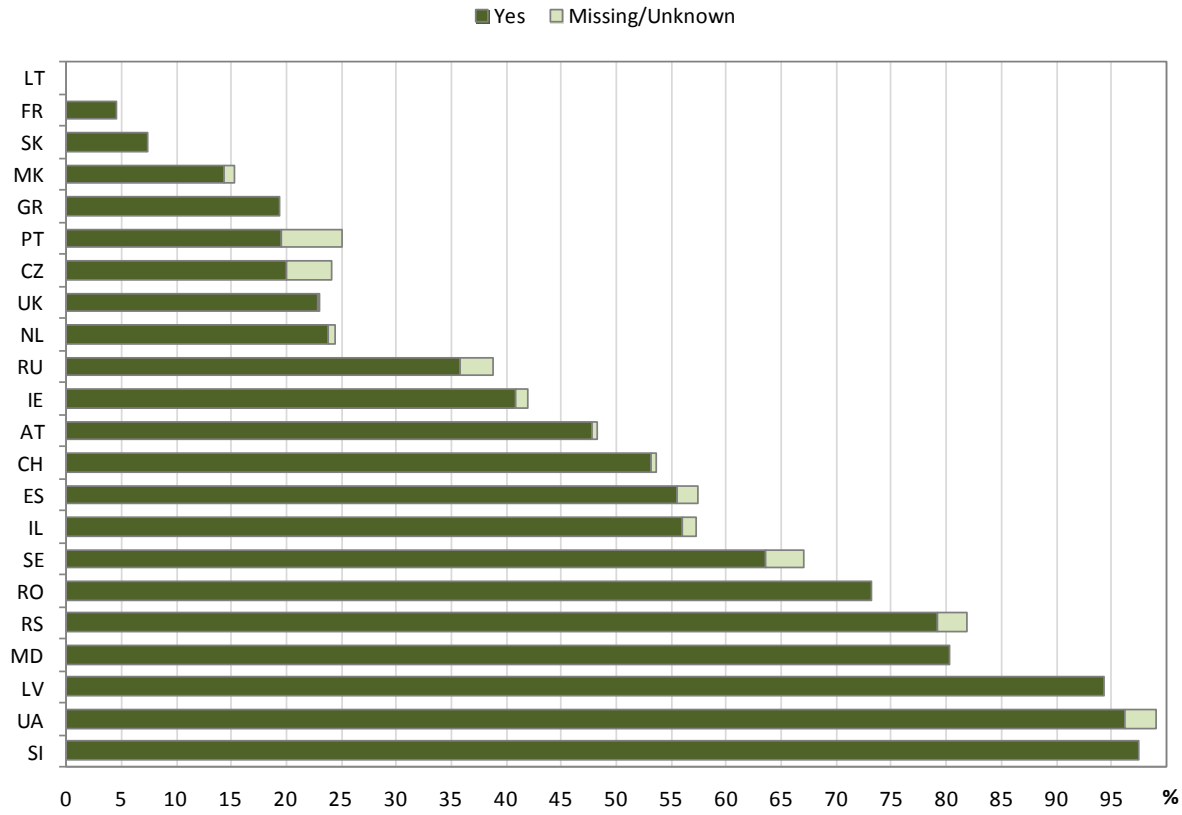
Country	Hypertonic saline (NaCl) inhaled > 3 months this year number (%)			rhDNase inhaled > 3 months this year number (%)			Bronchodilators inhaled > 3 months this year number (%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Austria	3 (0.56)	275 (51.69)	254 (47.74)	2 (0.38)	236 (44.36)	294 (55.26)	1 (0.19)	57 (10.71)	474 (89.10)
Belgium[1]	136 (11.80)	437 (37.90)	580 (50.30)	136 (11.80)	287 (24.89)	730 (63.31)	136 (11.80)	233 (20.21)	784 (68.00)
Czech Republic	24 (4.08)	446 (75.85)	118 (20.07)	24 (4.08)	227 (38.61)	337 (57.31)	24 (4.08)	289 (49.15)	275 (46.77)
Denmark	466 (100)	-	-	0 (0)	85 (18.24)	381 (81.76)	466 (100)	-	-
France	0 (0)	6004 (95.51)	282 (4.49)	0 (0)	3349 (53.28)	2937 (46.72)	0 (0)	3130 (49.79)	3156 (50.21)
Greece	0 (0)	79 (80.61)	19 (19.39)	1 (1.02)	33 (33.67)	64 (65.31)	0 (0)	44 (44.90)	54 (55.10)
Hungary	93 (18.38)	176 (34.78)	237 (46.84)	101 (19.96)	150 (29.64)	255 (50.40)	93 (18.38)	193 (38.14)	220 (43.48)
Ireland	12 (1.13)	617 (58.04)	434 (40.83)	12 (1.13)	598 (56.26)	453 (42.62)	12 (1.13)	352 (33.11)	699 (65.76)
Israel	7 (1.32)	226 (42.72)	296 (55.95)	7 (1.32)	201 (38.00)	321 (60.68)	7 (1.32)	201 (38.00)	321 (60.68)
Italy	1757 (36.83)	1929 (40.43)	1085 (22.74)	1019 (21.36)	2576 (53.99)	1176 (24.65)	1758 (36.85)	848 (17.77)	2165 (45.38)
Latvia	0 (0)	2 (5.71)	33 (94.29)	1 (2.86)	7 (20.00)	27 (77.14)	1 (2.86)	5 (14.29)	29 (82.86)
Lithuania	0 (0)	13 (100)	0 (0)	0 (0)	1 (7.69)	12 (92.31)	0 (0)	2 (15.38)	11 (84.62)
Rep of Macedonia	1 (1.02)	83 (84.69)	14 (14.29)	1 (1.02)	36 (36.73)	61 (62.24)	1 (1.02)	4 (4.08)	93 (94.90)
Rep of Moldova	0 (0)	12 (19.67)	49 (80.33)	0 (0)	61 (100)	0 (0)	0 (0)	12 (19.67)	49 (80.33)
The Netherlands	7 (0.52)	1014 (75.62)	320 (23.86)	4 (0.30)	507 (37.81)	830 (61.89)	3 (0.22)	780 (58.17)	558 (41.61)
Portugal	14 (5.47)	192 (75.00)	50 (19.53)	14 (5.47)	62 (24.22)	180 (70.31)	15 (5.86)	107 (41.80)	134 (52.34)
Romania	0 (0)	11 (26.83)	30 (73.17)	0 (0)	13 (31.71)	28 (68.29)	0 (0)	7 (17.07)	34 (82.93)
Russian Federation	58 (3.02)	1175 (61.13)	689 (35.85)	31 (1.61)	127 (6.61)	1764 (91.78)	71 (3.69)	639 (33.25)	1212 (63.06)
Serbia	4 (2.60)	28 (18.18)	122 (79.22)	1 (0.65)	83 (53.90)	70 (45.45)	3 (1.95)	4 (2.60)	147 (95.45)
Slovak Republic	0 (0)	138 (92.62)	11 (7.38)	0 (0)	61 (40.94)	88 (59.06)	0 (0)	66 (44.30)	83 (55.70)
Slovenia	0 (0)	2 (2.47)	79 (97.53)	0 (0)	55 (67.90)	26 (32.10)	1 (1.23)	70 (86.42)	10 (12.35)
Spain	26 (1.89)	585 (42.58)	763 (55.53)	26 (1.89)	1094 (79.62)	254 (18.49)	27 (1.97)	378 (27.51)	969 (70.52)
Sweden	22 (3.58)	202 (32.90)	390 (63.52)	22 (3.58)	477 (77.69)	115 (18.73)	23 (3.75)	63 (10.26)	528 (85.99)
Switzerland	3 (0.45)	307 (46.37)	352 (53.17)	4 (0.60)	393 (59.37)	265 (40.03)	3 (0.45)	80 (12.08)	579 (87.46)
Ukraine	3 (2.86)	1 (0.95)	101 (96.19)	1 (0.95	104 (99.05	0 (0	3 (2.86	42 (40.00	60 (57.14
United Kingdom[2]	13 (0.14)	6965 (76.96)	2072 (22.90)	0 (0)	4436 (49.02)	4614 (50.98)	0 (0)	4434 (48.99)	4616 (51.01)

[1] Belgium: most of the patients that have missing values are transplanted patients.

[2] United Kingdom: the duration of use of inhaled hypertonic saline and of bronchodilators is not specified.

This table shows the use of three different inhaled medications: hypertonic saline, rhDNase (Pulmozyme®) and bronchodilators (see page 12 for abbreviations). All of these medications are widely used, but still with marked differences among the countries.

Figure 7.5 Use of inhaled hypertonic saline in all patients seen in 2013, by country.

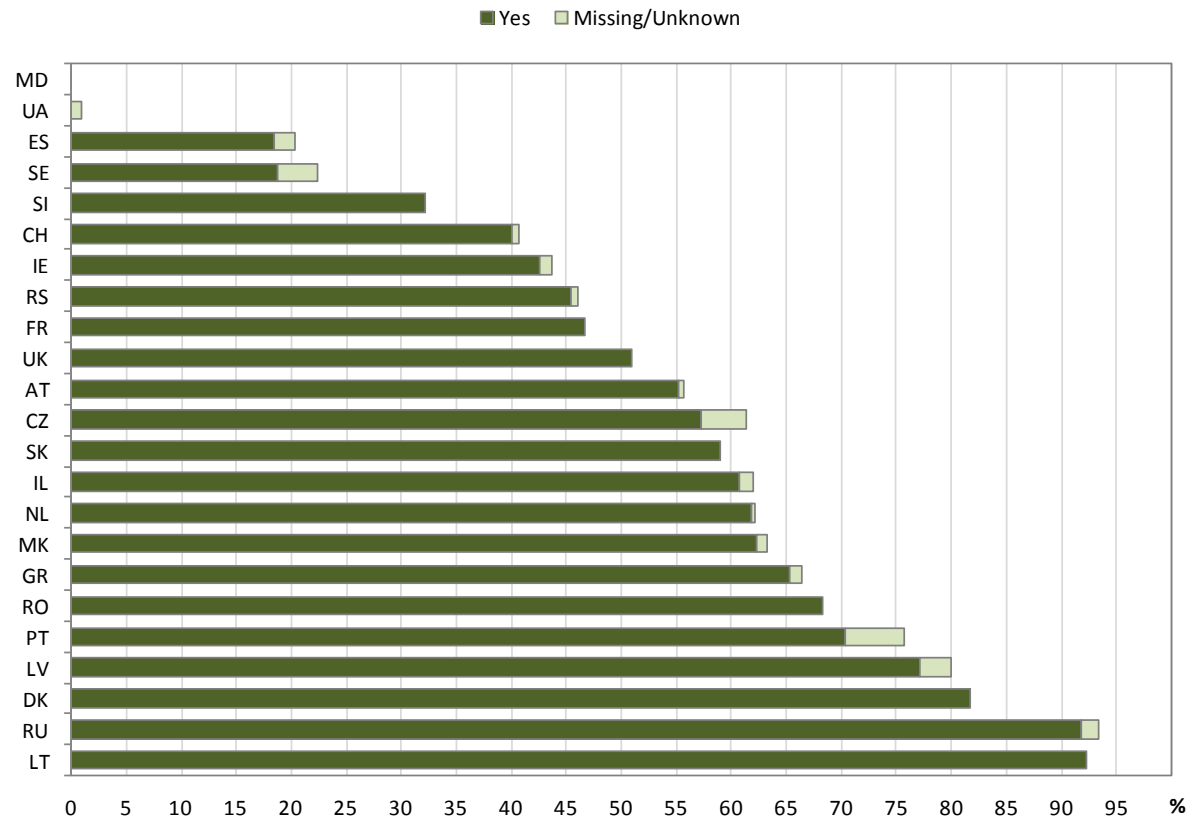


Note: We excluded from the graph the countries for which the information on inhaled hypertonic saline was missing for more than 10% of the patients.

Note: Belgium: most of the patients that have missing values are transplanted patients.
United Kingdom: the duration of use of inhaled hypertonic saline is not specified.

This table shows the use of inhaled hypertonic saline for more than three months during the survey year. The dark green part of the bar indicates the percentage of patients taking the medication, the light green part shows the percentage of patients for whom this information is missing.

Figure 7.6 Use of rhDNase in all patients seen in 2013, by country.



Note: We excluded from the graph the countries for which the information on rhDNase was missing for more than 10% of the patients.

Note: For Belgium most of the patients that have missing values are transplanted patients.

This graph shows the use of rhDNase (marketed as Pulmozyme®) as inhalations for more than 3 months during the survey year. The dark green part of the bar indicates the percentage of patients taking this drug, the light green part shows the percentage of patients for whom this information is missing.

Figure 7.7 Use of bronchodilators in all patients seen in 2013, by country.

Note: We excluded from the graph the countries for which the information on use of bronchodilators was missing for more than 10% of the patients.

Note: Belgium: most of the patients that have missing values are transplanted patients.

United Kingdom: the duration of use of bronchodilators is not specified.

This graph shows the use of bronchodilators for more than three months during the survey year. This is the most widely used inhaled medication, but still there are large differences in frequency of use between countries. The dark green part of the bar indicates the percentage of patients taking this drug, the light green part shows the percentage of patients for whom this information is missing.

Table 7.5 Use of inhaled antibiotics, macrolides and oxygen in all patients seen in 2013, by country.

Country	Inhaled antibiotics inhaled > 3 months this year number (%)			Oxygen therapy this year number (%)			Macrolides > 3 months this year number (%)		
	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes	Missing/ unknown	No	Yes
Austria	0 (0)	330 (62.03)	202 (37.97)	0 (0)	502 (94.36)	30 (5.64)	3 (0.56)	458 (86.09)	71 (13.35)
Belgium[1]	139 (12.06)	420 (36.43)	594 (51.52)	139 (12.06)	992 (86.04)	22 (1.91)	136 (11.80)	541 (46.92)	476 (41.28)
Czech Republic	24 (4.08)	416 (70.75)	148 (25.17)	24 (4.08)	538 (91.50)	26 (4.42)	24 (4.08)	477 (81.12)	87 (14.80)
Denmark	466 (100)	-	-	466 (100)	-	-	466 (100)	-	-
France[2]	0 (0)	3864 (61.47)	2422 (38.53)	0 (0)	5999 (95.43)	287 (4.57)	0 (0)	3580 (56.95)	2706 (43.05)
Greece	2 (2.04)	30 (30.61)	66 (67.35)	0 (0)	96 (97.96)	2 (2.04)	0 (0)	83 (84.69)	15 (15.31)
Hungary	119 (23.52)	233 (46.05)	154 (30.43)	93 (18.38)	370 (73.12)	43 (8.50)	92 (18.18)	327 (64.62)	87 (17.19)
Ireland	106 (9.97)	558 (52.49)	399 (37.54)	12 (1.13)	1010 (95.01)	41 (3.86)	24 (2.26)	676 (63.59)	363 (34.15)
Israel	7 (1.32)	237 (44.8)	285 (53.88)	9 (1.70)	509 (96.22)	11 (2.08)	8 (1.51)	239 (45.18)	282 (53.31)
Italy	1019 (21.36)	2377 (49.82)	1375 (28.82)	1019 (21.36)	3568 (74.79)	184 (3.86)	1018 (21.34)	2452 (51.39)	1301 (27.27)
Latvia	1 (2.86)	12 (34.29)	22 (62.86)	0 (0)	32 (91.43)	3 (8.57)	1 (2.86)	24 (68.57)	10 (28.57)
Lithuania	0 (0)	13 (100)	0 (0)	0 (0)	12 (92.31)	1 (7.69)	0 (0)	13 (100)	0 (0)
Rep of Macedonia	1 (1.02)	59 (61.20)	38 (38.78)	1 (1.02)	95 (96.94)	2 (2.04)	1 (1.02)	77 (78.57)	20 (20.41)
Rep of Moldova	0 (0)	29 (47.54)	32 (52.46)	0 (0)	57 (93.44)	4 (6.56)	0 (0)	27 (44.26)	34 (55.74)
The Netherlands	6 (0.45)	782 (58.31)	553 (41.24)	3 (0.22)	1283 (95.67)	55 (4.10)	4 (0.30)	769 (57.35)	568 (42.36)
Portugal	15 (5.86)	115 (44.92)	126 (49.22)	14 (5.47)	228 (89.06)	14 (5.47)	15 (5.86)	145 (56.64)	96 (37.50)
Romania	0 (0)	24 (58.54)	17 (41.46)	0 (0)	41 (100)	0 (0)	0 (0)	38 (92.68)	3 (7.32)
Russian Federation	62 (3.23)	1104 (57.44)	756 (39.33)	64 (3.33)	1756 (91.36)	102 (5.31)	69 (3.59)	1200 (62.43)	653 (33.98)
Serbia	1 (0.65)	100 (64.94)	53 (34.42)	1 (0.65)	146 (94.81)	7 (4.55)	0 (0)	138 (89.61)	16 (10.39)
Slovak Republic	1 (0.67)	70 (46.98)	78 (52.35)	0 (0)	147 (98.66)	2 (1.34)	0 (0)	89 (59.73)	60 (40.27)
Slovenia	1 (1.23)	68 (83.95)	12 (14.81)	0 (0)	79 (97.53)	2 (2.47)	0 (0)	76 (93.83)	5 (6.17)
Spain	31 (2.26)	623 (45.34)	720 (52.40)	28 (2.04)	1301 (94.69)	45 (3.28)	26 (1.89)	824 (59.97)	524 (38.14)
Sweden	30 (4.89)	539 (87.79)	45 (7.33)	24 (3.91)	576 (93.81)	14 (2.28)	23 (3.75)	386 (62.87)	205 (33.39)
Switzerland	6 (0.91)	406 (61.33)	250 (37.76)	4 (0.60)	633 (95.62)	25 (3.78)	4 (0.60)	460 (69.49)	198 (29.91)
Ukraine	3 (2.86)	65 (61.90)	37 (35.24)	1 (0.95)	99 (94.29)	5 (4.76)	3 (2.86)	7 (6.67)	95 (90.48)
United Kingdom[3]	10 (0.11)	4081 (45.09)	4959 (54.80)	83 (0.92)	8358 (92.35)	609 (6.73)	1 (0.01)	5194 (57.39)	3855 (42.60)

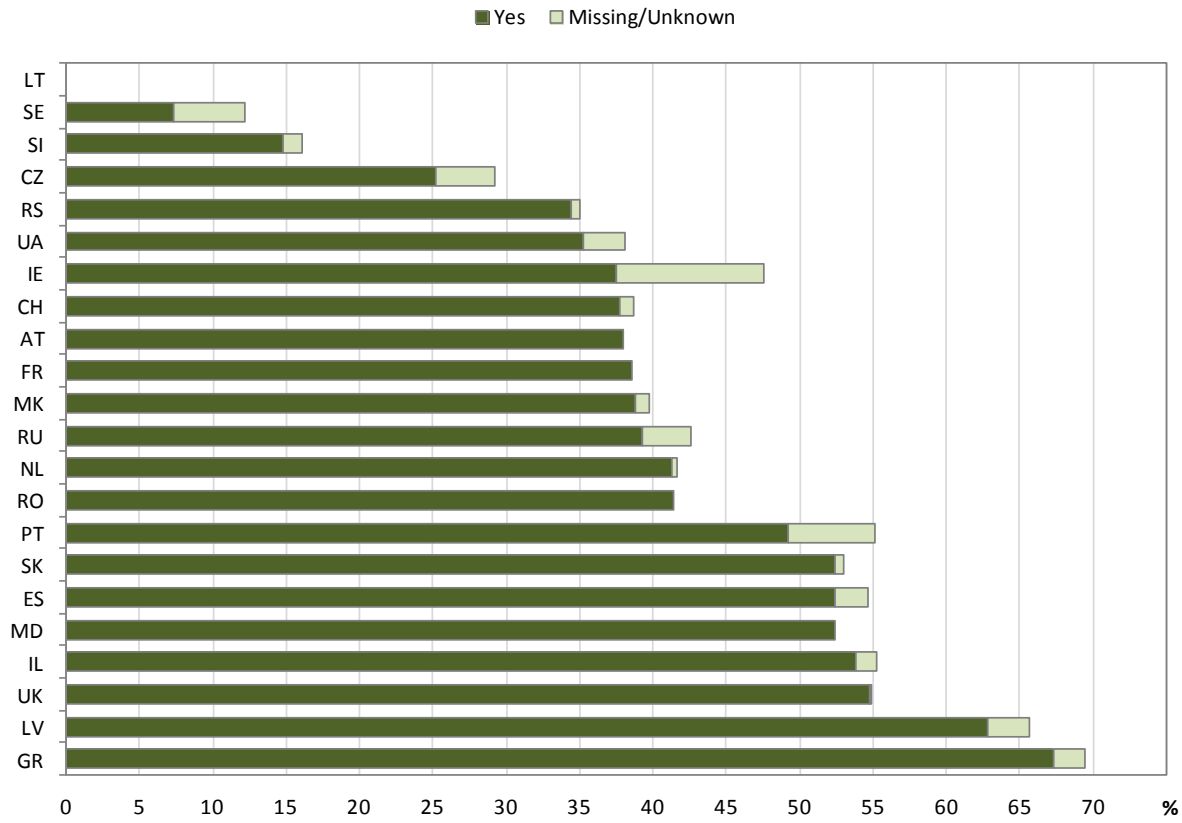
[1] Belgium: most of the patients that have missing values are transplanted patients.

[2] France: collects only use of azithromycin.

[3] United Kingdom: the duration of use of macrolides is not specified.

This table shows the use of three treatments: inhaled antibiotics for more than 3 months during the survey year (any kind); macrolides (e.g. azithromycin) for more than three months; oxygen for home treatment. Both inhaled antibiotics and macrolides are frequently used but with marked differences between countries. Oxygen is used less frequently (severe lung disease).

Figure 7.8 Use of inhaled antibiotics in all patients seen in 2013, by country.

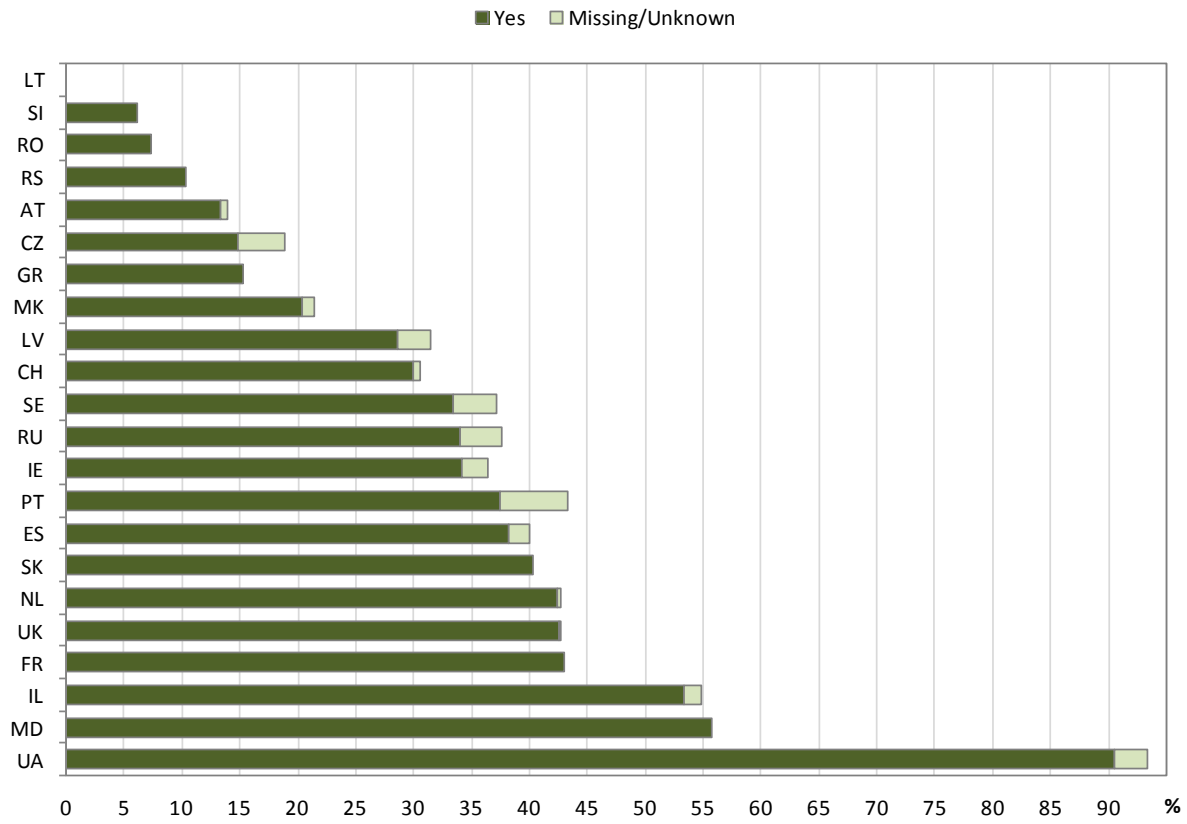


Note: We excluded from the graph the countries for which the information on inhaled antibiotics was missing for more than 10% of the patients.

Note: For Belgium most of the patients that have missing values are transplanted patients.

This graph shows the use of inhaled antibiotics (of any kind) for more than three months during the survey year. The frequency varies considerably, from 7 to 70%. The dark green part of the bar shows the percentage of patients taking this drug, the light green part shows the percentage of patients for whom this information is missing.

Figure 7.9 Use of macrolides in all patients seen in 2013, by country.

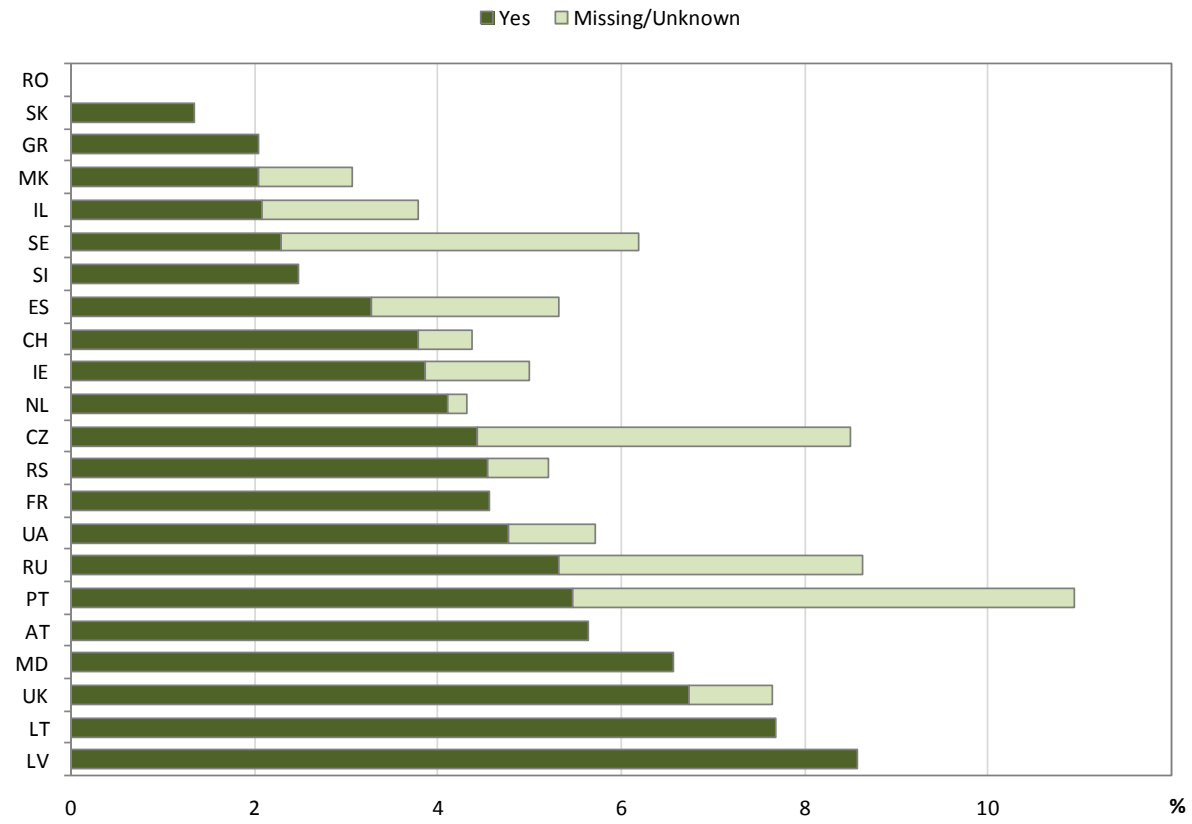


Note: We excluded from the graph the countries for which the information on use of macrolides was missing for more than 10% of the patients.

Note: Belgium: most of the patients that have missing values are transplanted patients.
France: collects only use of azithromycin.
United Kingdom: the duration of use of macrolides is not specified.

This graph shows the use of macrolides for more than 3 months during the survey year (e.g. azithromycin). Macrolides are antibiotics, but taken continuously they also modulate the immune system. The dark green part of the bar indicates the percentage of patients taking this drug, the light green part shows the percentage of patients for whom this information is missing.

Figure 7.10 Use of oxygen in all patients seen in 2013, by country.



Note: We excluded from the graph the countries for which the information on the use of oxygen was missing for more than 10% of the patients.

Note: For Belgium most of the patients that have missing values are transplanted patients.

This graph shows the use of oxygen at home during the survey year. Oxygen is used for severe lung disease. The dark green part of the bar indicates the percentage of patients using oxygen supplementation, the light green part shows the percentage of patients for whom this information is missing.

8. Transplantation

We ask the countries whether their patients are transplanted or not, and if they are, in which year they had their (latest) transplant.

In some countries, such as The Netherlands, transplanted patients are no longer registered in the CF centres' database and the CF national registry, because the patients have been transferred to a transplant centre. For this reason, the figures below may report a lower number of transplanted patients than the true number, but it has not been possible to acquire more accurate data.

Table 8.1 Number of patients living in 2013 with transplanted lungs, by age and sex.

Age	Males	Females	Total	Transplants performed during the survey year
5-9	0	1	1	1
10-14	11	10	21	6
15-19	23	54	77	21
20-24	102	106	208	54
25-29	129	167	296	43
30-34	163	164	327	38
35-39	157	137	294	27
40-44	119	101	220	16
45+	140	90	230	20
Total	844	830	1674	226

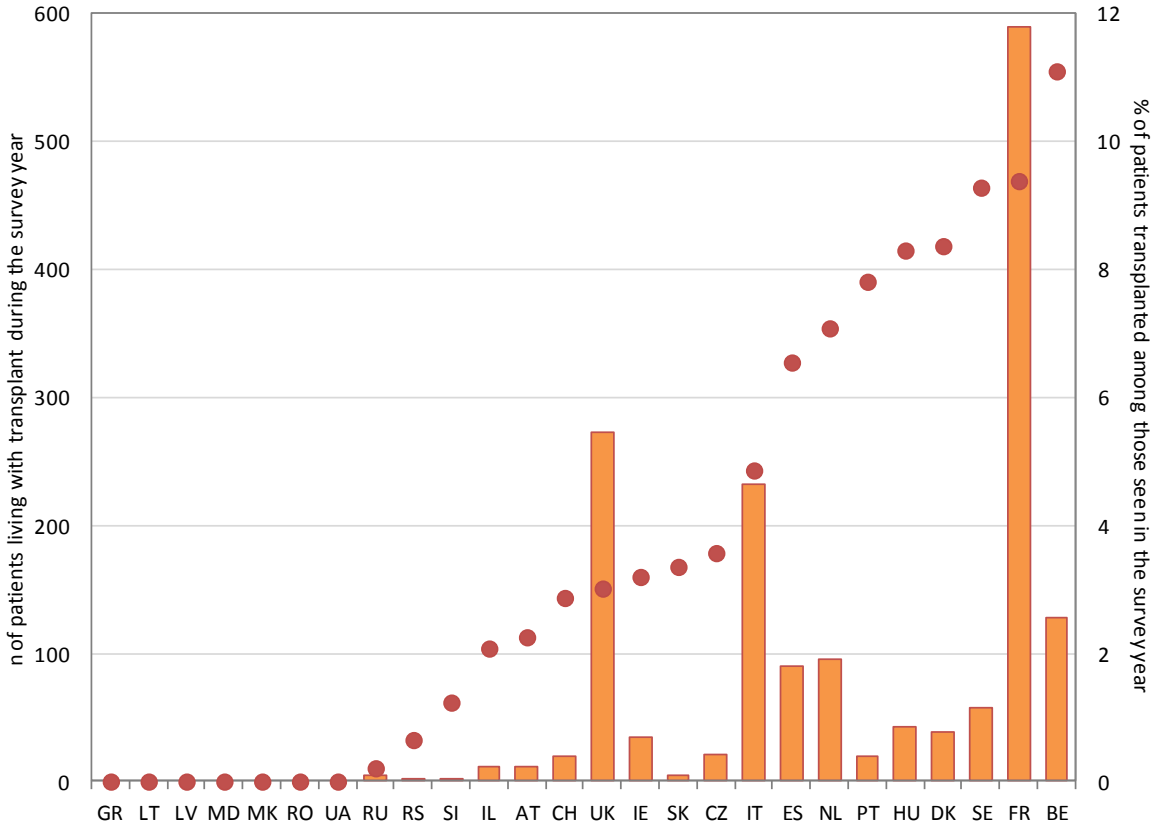
This table shows the number of patients alive in 2013 who have had a lung transplant at some time in their life, by age group, as well as the number of patients transplanted during 2013.

Table 8.2 Number of patients living in 2013 with transplanted liver, by age and sex.

Age	Males	Females	Total	Transplants performed during the survey year
0-4	1	0	1	0
5-9	3	2	5	0
10-14	4	2	6	1
15-19	16	8	24	6
20-24	20	12	32	4
25-29	22	16	38	1
30-34	23	10	33	1
35-39	17	1	18	0
40-44	7	7	14	0
45+	3	1	4	0
Total	116	59	175	13

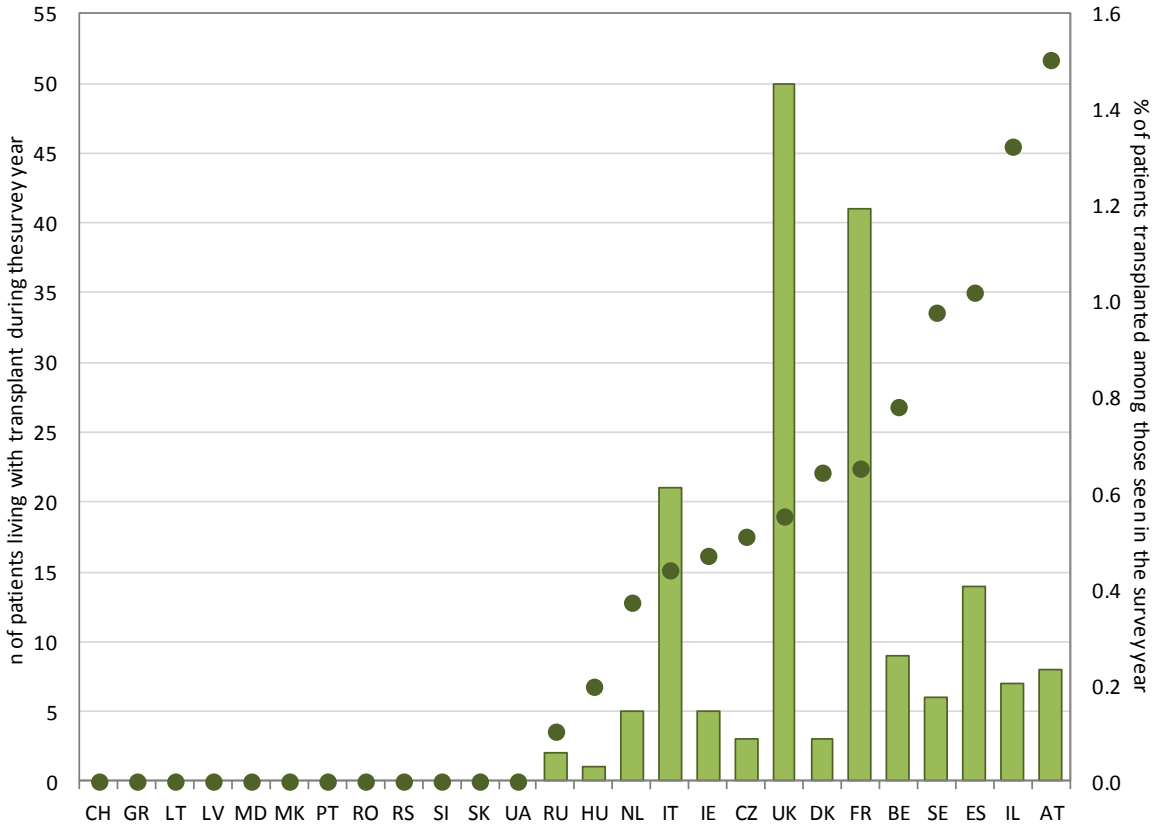
This table shows the number of patients alive in 2013 who have had a liver transplant at some time in their life, by age group, as well as the number of patients transplanted during 2013.

Figure 8.1 Number of patients living in 2013 with transplanted lungs, by country.



This graph shows the number of patients alive in 2013 who have had a lung transplant (orange bars) at some point in their life. The red dots (right axis) show the percentage of patients that are living with lung transplant in 2013 among the patients that were seen in 2013.

Figure 8.2 Number of patients living in 2013 with transplanted liver, by country.



This graph shows the number of patients alive in 2013 who have had a liver transplant (green bars) at some point in their life. The dark green dots (right axis) show the percentage of patients that are living with liver transplant in 2013 among the patients that were seen in 2013.

Note that on the vertical axis the number of patients with liver transplant is much lower than the number with lung transplant. The main reason for this is that liver disease is only found in a subset of CF patients, whereas lung disease affects almost all patients.

9. Mortality

Table 9.1 Number of deaths in 2013, by age and sex.

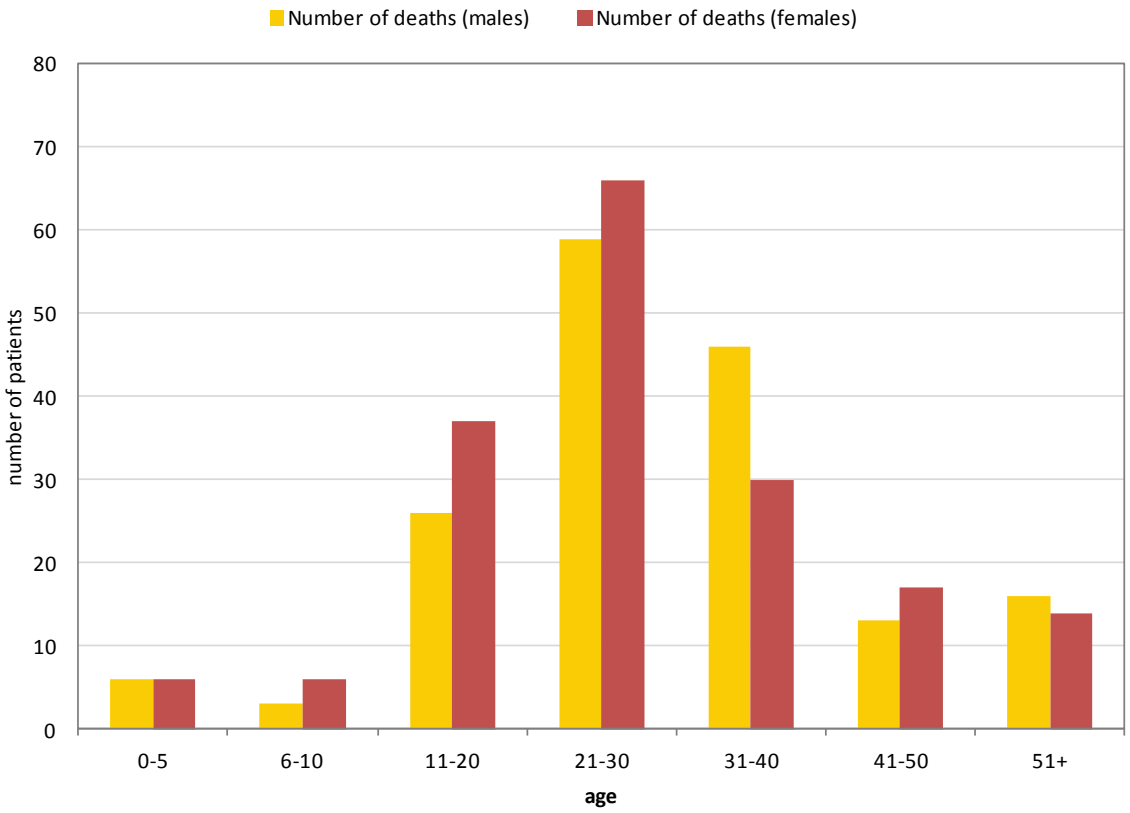
Age at death	Number of male patients	% of deaths in this age group of all male deaths	Number of female patients	% of deaths in this age group of all female deaths	Total	% Total
0-5	6	3.55	6	3.41	12	3.48
6-10	3	1.78	6	3.41	9	2.61
11-20	26	15.38	37	21.02	63	18.26
21-30	59	34.91	66	37.50	125	36.23
31-40	46	27.22	30	17.05	76	22.03
41-50	13	7.69	17	9.66	30	8.7
51+	16	9.47	14	7.95	30	8.7
Total	169	100	176	100	345	100

Note: Only patients seen during the year are presented and German 2010 data (N=5,003) is not considered. For the United Kingdom, all patients with confirmed diagnosis of CF were included (N=10,336). The total number of patients presented is 33,234.

Note: For 2 patients (1 male and 1 female) date at death, and thereby age at death, is unknown.

This table shows the number of deaths in 2013 by age group and sex. Death in small children is very rare, and the most frequent range of age of death for both sexes is 21-30 years.

Figure 9.1 Age at death distribution of patients deceased in 2013, by sex.



Note: Only patients seen during the year are presented and German 2010 data (N=5,003) is not considered. For the United Kingdom, all patients with confirmed diagnosis of CF were included (N=10,336). The total number of patients presented is 33,234.

Note: For 2 patients (1 male and 1 female) date at death, and thereby age at death, was unknown.

This graph shows the distribution of age at death of patients who died in 2013, separately by males (yellow) and females (red).

Table 9.2 Cause of death distribution of deaths in 2013.

Cause of death	Number of deaths	Percentage of all deaths
Respiratory disease	245	70.61
Transplantation related	37	10.66
Non-CF related	19	5.48
Liver-GI related	6	1.73
Suicide	2	0.58
Trauma	1	0.29
Unknown	37	10.67
Total		

Note: United Kingdom collects cause of death “respiratory disease” as “cardio/respiratory”.

This table shows cause of death for the deceased patients. The most frequent cause of death is respiratory disease. Please note that only a limited number of causes of death are collected, therefore if some deaths are due to rare complications of CF, they may have been classified as “Unknown”.

Publications

The ECFSPR data has been actively used for research in the years 2013 to 2015 and was handled in accordance with the ECFSPR guidelines (www.ecfs.eu/projects/efcs-patient-registry/guidelines).

Several of these research projects resulted in publications, and other publications are in the pipeline. We have made a complete overview of the articles published or accepted for publication in the period 2013 to 2015:

- Factors associated with FEV1 decline in cystic fibrosis: analysis of the data of the ECFS Patient Registry. Kerem E, Viviani L, Zolin A, MacNeill S, Hatziagorou E, Ellemunter H, Drevinek P, Gulmans V, Krivec U, Olesen H; on behalf of the ECFS Patient Registry Steering Group. The European Respiratory Journal Jan 2014, 43(1): 125-33.

- Multi-Country Estimate of Different Manifestations of Aspergillosis in Cystic Fibrosis. Amstead J., Morris J., Denning D.W. PlosOne 2014, June 10.

- The relative frequency of CFTR mutation classes in European patients with cystic fibrosis. De Boeck K, Zolin A, Cuppens H, Olesen HV, Viviani L. Journal of Cystic Fibrosis 2014, Jul;13(4):403-9.

- The European Cystic Fibrosis Society Patient Registry: valuable lessons learned on how to sustain a disease registry. Laura Viviani, Anna Zolin, Anil Mehta, Hanne Vebert Olesen. Orphanet Journal of Rare Diseases 2014, 9:81.

- Future trends in Cystic Fibrosis demography in 34 European countries. Burgel P-R; Bellis G, Olesen HV, Viviani L, Zolin A, Blasi F and Elborn JS. on behalf of the ERS/ECFS Task Force on The Provision of Care for Adults with Cystic Fibrosis in Europe 2015. European Respiratory Journal Jul 2015, 16(1): 133-141.

The following abstracts were accepted in the years 2013 to 2015:

- ECFSTracker: Building a new patient registry software. Van Rens J, McKone E, on behalf of the European Cystic Fibrosis Society Patient registry. 7th European Conference on Rare Diseases & Orphan Products May 2014 in Berlin, Germany.

- Description of lung function of the European cystic fibrosis patients. Zolin A, Bossi A. 1st Workshop on Large scale population-based surveys on respiratory health in Italy and Europe, Italian Society of Medical Statistics and Clinical Epidemiology – Verona 23-24 October 2014.

- FEV1% predicted in patients with at least one nonsense mutation and patients homozygous for F508del. Zolin A, De Boeck K. J Cyst Fibros. 2015 Jun;14(1):S32.

- Patients with cystic fibrosis and the R117H mutation: the European experience. Naehrlich L, Zolin A, Colombo C, De Boeck K, Kashirskaya N, Olesen HV, J Cyst Fibros. 2015 Jun;14(1):S32.

- Risk factors for reduced pulmonary function in European cystic fibrosis patients. Zolin A, Bossi A; De Boeck K. Joint meeting of the International Biometric Society (IBS) Austro-Swiss and Italian Regions – Milano 16-18 June 2015, p.36.

- “Big data” for a rare disease: complexity and usefulness. Zolin A, Viviani L, Bossi A, Mehta A, Olesen H. 8th National Congress of the Italian Society of Medical Statistics and Clinical Epidemiology – Torino 17-19 September 2015.

Partners and Contributors

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Appendix 1: Technical notes

Patient inclusion criteria

The ECFSPR registers patients diagnosed with CF in accordance with agreed definitions (see Appendix 2). Data of patients with a diagnosis that does not meet the agreed definitions are accepted in the database but not included in the analyses.

Data manipulation

To ensure that data was anonymous, we collected only year and month of birth and the day of birth was set to the 15th of the month (for Belgium, which only supplies year of birth for adults, month of birth was set to 7).

Unknown dates of lung function tests and of height/weight measurements were set to July 1st of the survey year.

For pre-natal diagnoses, we set age at diagnosis equal to 0.

We checked for outliers and, whenever possible, we corrected the values according to the national registries'/individual centres' instructions. If, after the data quality controls, aberrant values were still present in the database, we set them to missing for the purposes of this report.

Reference populations used for computing z-scores

The value of a z-score depends on the reference anthropometric chart: if different reference values are used, the same value of height (or weight or BMI) will result in different values of z-scores, and these differences might be of clinical importance. To compare the nutritional status of CF patients with that of healthy individuals an appropriate reference population must be used: ideally, a fair comparison requires that CF patients and healthy individuals belong to the same population. This implies the availability of a national reference.

The lack of a national reference for most countries participating in the ECFSPR forced us to use an international reference to compute z-scores for height, weight and BMI. We decided to use the CDC 2000 reference charts (Kuczmarski RJ, Ogden CL, Guo SS et al. 2000 CDC Growth Charts for the United States: Methods and Development. National Centre for Health Statistics. Vital Health Stat 2002; 11(246):1-190.), which were derived from samples of U.S. healthy individuals[1]. The choice of CDC charts as a reference, although not the most suitable to assess the nutritional status of European CF patients, is justified by the widespread use of these charts at international level.

Reference populations used for computing FEV_1 predicted values

We computed percent of predicted values for FEV_1 and FVC using:

- for male children (6-17 years) and female children (6-15 years):
  Wang X, Dockery DW, Wypij D, Fay ME, Ferris BG. Pulmonary function between 6 and 18 years of age. Pediatr Pulmonol 1993; 15:75-88.
- for male adults (≥18 years) and female adults (≥16 years):
  Hankinson JL, Odencrantz RJ, Fedan KB. Spirometric reference values from a sample of the general U.S. population. Am J Respr Crit Care Med 1999; 159:179-87.

Software used for data management and statistical analyses

SAS software, Version 9.2. Copyright, SAS Institute Inc. SAS and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc., Cary, NC, USA.

[1] For details on the target population, please see www.cdc.gov/growthcharts/2000growthchart-us.pdf.

Appendix 2: List of variables, inclusion criteria and definitions used by the ECFSPR

List of variables

Demographics
CF centre code
Patient code
Year of follow-up
Date of birth (year and month)
Gender
Status of patient
Cause of death
Date of death

Therapy
Inhaled continuous hypertonic NaCl this year
Inhaled continuous antibiotic this year
Inhaled continuous bronchodilators this year
In Oxygen therapy this year
Use of rhDNase this year
Use of continuous azithromycin (or other macrolide) this year
Use of ursodeoxycholic acid this year
Use of pancreatic enzymes this year

Diagnosis
Diagnosis confirmed
Age at diagnosis
Type of sweat test
Electrolytes
Chloride value
Meconium Ileus
Neonatal screening

Complications
Allergic bronchopulmonary aspergillosis this year
Diabetes: daily insulin treated this year
Pneumothorax requiring chest drain this year
Liver disease this year
Haemoptysis major over 250 ml this year
Pancreatic status: faecal elastase
Pancreatic status: faecal fat
Occurrence of malignancy this year

Genotype
First mutation
Second mutation

Microbiology
Chronic *Burkholderia cepacia complex*
Nontuberculous mycobacteria this year
Chronic *Pseudomonas aeruginosa*
Chronic *Staphylococcus aureus*
Stenotrophomonas maltophilia this year

Follow-up
Date of best FEV_1 recorded this year
Value of best FEV_1 recorded this year
Value of best FVC recorded this year
Height measured at date of best FEV_1 (or in case of no FEV_1 last height of the year)
Weight measured at date of best FEV_1 (or in case of no FEV_1 last height of the year)

Transplant
Liver transplant
Year of latest liver transplant (if occurred before or during this year)
Lung transplant
Year of latest lung transplant (if occurred before or during this year)

Inclusion criteria

Only patients who fulfil the diagnostic criteria below should be included in the registry.

a. **Two sweat tests value > 60 mmol/L chloride**: CF diagnosis accepted
b. **One sweat test value > 60 mmol/L chloride and DNA Analysis/Genotyping – two identified disease causing CF mutations**: CF diagnosis accepted
c. **Sweat value less than or equal to 60 mmol/L chloride**: if the sweat value is less than or equal to 60 mmol/L chloride, then at least 2 of these should be met:
    i. DNA Analysis/Genotyping – two identified disease causing CF mutations.
    ii. Transepithelial (Nasal) Potential Difference – study consistent with a diagnosis of CF.
    iii. Clinical Presentation – typical features of CF.
d. **Diagnosis reversal**: if the patient's CF diagnosis reversed during the year, identify the reason from the following options:
    i. DNA Analysis – unable to identify two disease causing CF mutations.
    ii. Transepithelial (Nasal) Potential Difference – study not consistent with a diagnosis of CF.
    iii. Repeat normal sweat testing – confirm with clinical team.

Definitions for EFCSPR

SWEAT TEST

If a sweat test was not performed on a patient, record "not done". If a sweat test is "not done" then two known genotype mutations must be reported.

i. Sweat Test: record the patient's sweat test.
ii. Electrolytes: Chloride concentration measurement is the preferred analysis.
iii. Chloride value: report the Chloride value in millimols per litre (mmol/L). If duplicate tests were completed on the same day, report the highest positive value.

NOTE: The acceptable range for Chloride values is 1-160 mmol/L. Anyone who has a Chloride value above 160 mmol/L must be re-tested.

SPIROMETRY

The purpose of recording data on spirometry values for the ECFS Patient Registry is to obtain standardised comparable data for comparison with other centres/countries and for use in specific epidemiological studies. Some of the conditions for this (see below) may not be met at every clinic visit for all patients. Therefore, for the purpose of the registry, only the spirometry tests fulfilling the criteria should be recorded/extracted for the ECFS Patient Registry. For all tests the spirometry should be performed according to the common ATS/ERS guidelines: (www.thoracic.org/statements/resources/pfet/PFT2.pdf).

Furthermore for the values reported to the registry the following criteria should be met

1. Pre-test
    a. date of birth, gender and height should be recorded for calculation of predicted values
    b. all recorded spirometry tests should be pre-bronchodilator* values
        i. short-acting bronchodilators: at least 4 hours pre-test
        ii. long-acting bronchodilators: at least 12 hours pre-test

    *This was decided according to the PortCF official definitions.
2. Reported values
    a. for values reported to national registries or to centres and extracted to the ECFS Patient Registry, the value in litres of the highest available value of FEV_1% of predicted (according to local references) of the year should be extracted
    b. each patient's FVC and FEV_1 measurement must be reported in litres (L), with up to two places to the right of the decimal
    c. the FVC measurement must be greater than or equal to the FEV_1 measurement
    d. for each reported spirometry value, the date of the test and the patient's height at that date should be reported in order to perform the calculation of percent of predicted values
    e. only tests deemed valid according to ATS/ERS guidelines should be reported
3. Calculation of percent of predicted values. A common set of reference values will be used
    a. for male children 6-17 yrs and female children 6-15 yrs: Wang et al (1993)
    b. for male adults ≥ 18 yrs and females ≥ 16 yrs: Hankinson et al (1999)
    c. for children < 6 yrs no calculation of percent of predicted values will be performed because of lack of valid reference values

The ECFSPR Definition Group considered the issue of race-specific reference values and decided not to do this calculation and not to record race for European patients.

References:
a) Miller et al. Standardisation of spirometry. Eur Respir J 2005; 26: 319–338
b) Miller et al. General considerations for lung function testing. Eur Respir J 2005; 26: 153–161
c) Cystic Fibrosis Foundation Patient Registry User's Guide, Version 4.0. 2006
d) Rosenfeld et al. Task Force to Evaluate Choice of Spirometric Reference Equations for the National Patient Registry: Summary and Recommendations. Cystic Fibrosis Foundation Registry Committee; 2005
e) Hankinson JL, Odencrantz RJ, Fedan KB. Spirometric reference values from a sample of the general U.S. population. Am J Respr Crit Care Med 1999;159:179-87
f) Wang X, Dockery DW, Wypij D, Fay ME, Ferris BG. Pulmonary function between 6 and 18 years of age. Pediatr Pulmonol 1993;15:75-88

NUTRITION

Measurements: weight and height are measured according to EuroCareCF guidelines

a. weight: removal of outer clothing, shoes and socks
b. height: without shoes and socks - stadiometer - top of head in contact with head board, slight pressure
c. it should be the value at the day of the recorded FEV_1

z-scores for height, weight and BMI will be calculated using the CDC reference values [Kuczmarski et al (2002)]

References:
a) Kromeyer-Hauschild K, Wabitsch M, Kunze D, Geller F, Geiss HC, Hesse V *et al.* Percentiles of body mass index in children and adolescents evaluated from different regional German studies. Monatsschr Kinderheilkd 2001; 149:807-818
b) Lai H-C, Corey M, FitzSimmons S, Kosorok MR, Farrell M. Comparision of growth status of patients with cystic fibrosis between the United States and Canada. Am J Clin Nutr 1999; 69:531-538
c) Public Use File BGS98, German National Health Interview and Examination Survey 1998, Robert-Koch-Institut, Berlin, Germany, 2000
d) Wiedemann B, Paul KD, Stern M, Wagner TO, Hirche TO, on behalf of the German CFQA Group. Evaluation of body mass index percentiles for assessment of malnutrition in children with cystic fibrosis. Eur J Clin Nutr 2007; 61, 759-768
e) Kuczmarski RJ, Ogden CL, Guo SS et al. 2000 CDC Growth Charts for the United States: methods and development. Vital Health Stat 2002; 11(246): 1-190

DEFINITION OF CHRONIC INFECTION IN THE LOWER AIRWAYS

1. Chronic PA infection should be defined by local physician according to modified Leeds criteria[a] and/or anti-pseudomonas antibodies[b]. Patient should be defined as chronically infected if he/she fulfils the criteria now or has done so in recent years and the physician has no reason to think the status has changed
   a. modified Leeds criteria, chronic infection: >50% of the sputum samples, collected during the last 12 months were positive. At least 4 sputum samples during that period
   b. and/or significantly raised anti-pseudomonas antibodies according to local laboratories
2. Chronic infection with other gram-negative bacteria should be recorded by the same criteria as above

References:
a) Lee TWR, Brownlee KG, Conway SP, Denton M, Littlewood JM. Evaluation of a new definition for chronic Pseudomonas aeruginosa in cystic fibrosis patients. J Cystic Fibrosis
b) Proesmans M, Balinska-Miskiewiscz, Dupont L et al. Evaluating the "Leeds criteria" for Pseudomonas aeruginosa infection in a cystic fibrosis centre. Eur Resp J 2006;27:937-943.
c) Doring G, Conway SP, Heijerman HG, et al. Antibiotic therapy against Pseudomonas aeruginosa in cystic fibrosis: a European consensus. Eur Respir J 2000;16:749-767

ALLERGIC BRONCHOPULMONARY ASPERGILLOSIS (ABPA)

Diagnostic criteria:

1. Acute or subacute clinical deterioration (cough, wheeze, exercise intolerance, exercise-induced asthma, change in pulmonary function, or increased sputum production) not attributable to another etiology.
2. Total IgE > 500 IU/ml.
3. Positive skin prick test for Aspergillus antigen (> 3 mm) or positive specific IgE for *A. fumigatus*.
4. Either:
   a. precipitins to *A. fumigatus* or in vitro demonstration of IgG antibody to *A. fumigatus*;
   b. or new or recent abnormalities on chest radiography (infiltrates or mucus plugging) or chest CT (characteristic changes) that have not cleared with antibiotics and standard physiotherapy.

References:
Stevens DA, Moss RB, Kurup VP, Knutsen AP, Greenberger P, Judson MA, Denning DW, Crameri R, Brody AS, Light M, Skov M, Maish W, Mastella G; Participants in the Cystic Fibrosis Foundation Consensus Conference. Allergic bronchopulmonary aspergillosis in cystic fibrosis--state of the art: Cystic Fibrosis Foundation Consensus Conference. Clin Infect Dis. 2003 Oct 1;37 Suppl 3:S225-64

LIVER DISEASE

We adopt the definitions for Liver Disease used by the UK Registry. These definitions discriminate patients with severe liver disease (with portal hypertension) from milder cases (cirrhosis without portal hypertension).

Cirrhosis with Hypertension: scaring of the liver related to underlying CF, typically in a biliary pattern. Severe liver disease may include portal hypertension and/or hypersplenism.

Cirrhosis without Hypertension: scaring of the liver relating to underlying CF.

Liver disease without cirrhosis: this includes fatty liver or viral hepatitis but not biliary cirrhosis.

PANCREATIC STATUS

Definition:

Stool fat (van de Kamer) > 4-5 g/d in young children, > 7g/d in children above 10 yrs and adults and/or faecal pancreatic elastase-1 < 200 ug/g.

Two determinations are mandatory. Faecal fat excretion values of infants below 3 months are contradictory. Other than pancreatic causes of steatorrhoea must have been excluded.

Pancreatic status will be assessed at the registry level, according to the following:

Pancreatic insufficiency

Faecal elastase <200 µg/g (twice) and Faecal fat high (twice)*

Pancreatic sufficiency

Faecal elastase ≥200 µg/g (twice) and Faecal fat normal (twice)*

*according to definition above

References:

a) Sinaasappel M, Stern M, Littlewood J, Wolfe S, Steinkamp G, Heijerman HGM, Robberecht E, Döring G. Nutrition in patients with cystic fibrosis. A European consensus. J Cystic Fibrosis 2002; 1:51-75.

b) Walkowiak J, Nousia-Arvanitakis S, Henker J, Stern M, Sinaasappel M, Dodge JA. Invited review: Indirect pancreatic function tests in children. J Pediatr Gastroenterol Nutr 2005; 40:107-114.